1959
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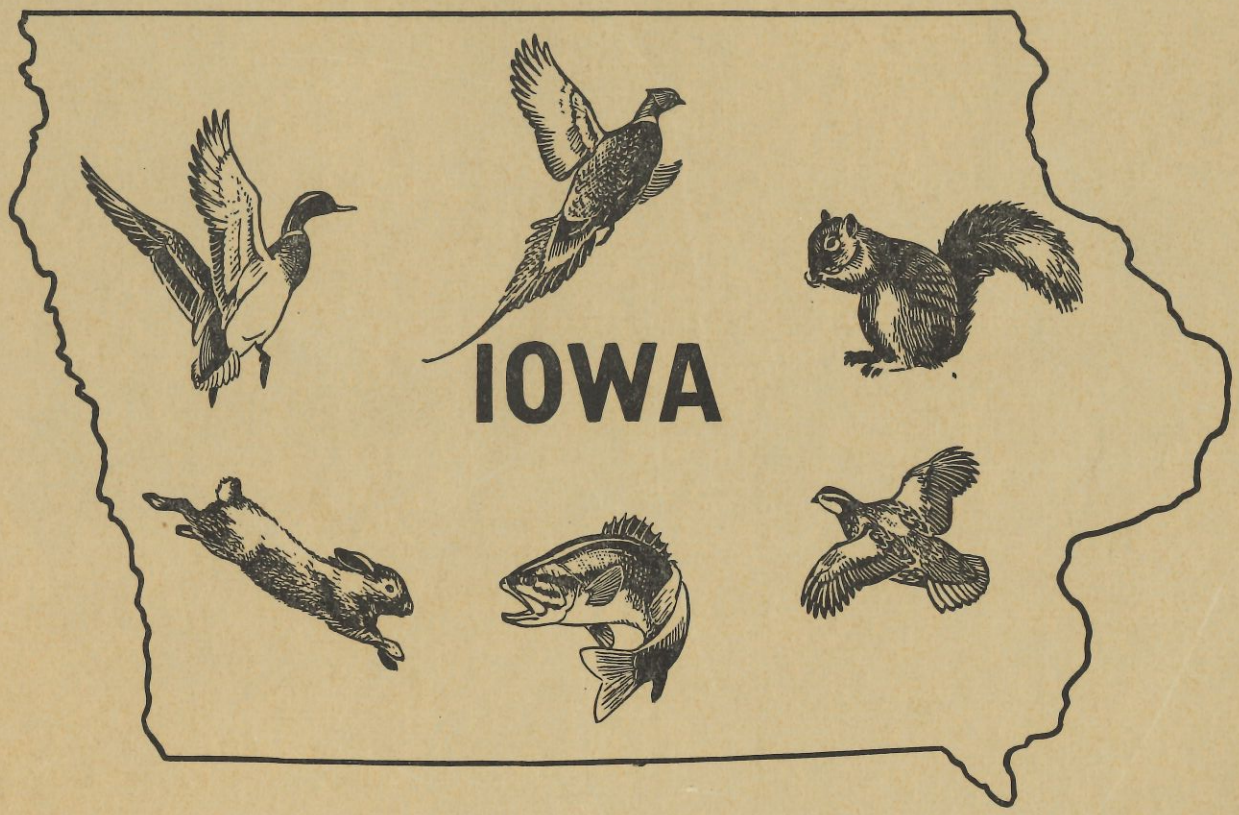
QUARTERLY BIOLOGY REPORTS



FISH AND GAME DIVISION — BIOLOGY SECTION

STATE CONSERVATION COMMISSION

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ABSTRACTS OF QUARTERLY BIOLOGY REPORTS

Year-Round Creel Census of Three Iowa Lakes

by

E. T. ROSE

Fisheries Biologist

Quantitative creel censuses were conducted on Spirit and the Okoboji Lakes from May 1, 1958 to February 15, 1959. One clerk censused Spirit Lake and one man censused both East and West Okoboji Lakes. All three lakes are in Dickinson County, Iowa. This was the third consecutive season of complete-type census for Spirit and the second for the Okoboji Lakes. The census technique was identical to last year providing comparable data for analyses. Basic summations and tables cover significant features of the census. The three lakes, with a combined area of 11,023 acres, produced a harvest of fish to anglers of a calculated 762,808 fish with a total weight of 449,711 pounds. A calculated total of 219,949 fishing trips were recorded involving 741,299 man-hours of fishing recreation. Reduced to basic harvest figures, the average acre of water in these lakes produced 69.2 fish which weighed 40.8 pounds, and had 19.9 man-days or 67.3 hours of fishing pressure.

The calculations are considered minimal since all are based on a sixteen hour fishing day from 6:00 A.M. to 10:00 P.M. Late night angling was necessarily excluded and doubtless represents a considerable fraction. Therefore these data may be considered as best extimates obtainable under a sampling system devised to minimize know areas of bias. An Electronic Computor (I.B.M. Model 650 Magnetic Drum Data-Processing Machine) processed the field data providing monthly summaries from which much of this report was prepared.

Preliminary Report, Maple River Studies

by

HARRY M. HARRISON

Fisheries Biologist

A study of fisherman use and fish populations in the Maple River was carried on in 1958. A species list involving 29 forms was compiled. Channel catfish and carp were the principal species occupying the drainage and sought by anglers. Populations studies were made at monthly intervals and these were related to the prevailing stream stage. Information obtained suggest that populations and individual sizes are adversely effected by low and or stable flows.

Angling was negligible in 1958. According to reports, poor fishing has persisted since 1956. Before 1956, angling was reported as having been good.

Inland River Creel Census and Angling Evaluation Southeast Iowa, 1958

by

R. E. CLEARY

Fisheries Biologist

A total of 518 anglers were contacted while fishing the lower reaches of the Wapsipinicon, Cedar, Iowa, and Des Moines rivers. Over 50 percent of the angling pressure on the lower reaches of these rivers occurred in the vicinity of the lowest of the dams on the river, and in each case was associated with a center of urban population. Forty-six percent of the anglers came to catch catfish and 13 percent to catch carp; 39 percent would take anything biting. They actually took 48 catfish, 36 carp and 9 bullheads in each 100 fish creeled.

Ninety percent of the anglers contacted were bank fishermen; seven out of eight were males and 60 to 70 percent were over 35 years old.

Angling success ranged from a high of .63 fish per hour on both the Cedar and Des Moines rivers, to a low of .25 on the Iowa river. The average for the four streams was .44 fish per hour.

It was calculated that the average angler fishing the lower reaches of these rivers made 5.4 trips per year and spent $32.00 per year on his sport. It was then estimated that these rivers were "worth" $2,973 a mile to the estimated 30,000 licensed anglers in the area who fish rivers; plus the un-evaluated annual recreational benefits of 1,570 hours of fishing per mile of river.

Oxygen Depletion and Winter Fish Kills in North East Iowa Streams 1958-1959

by

BILL TATE

Fisheries Biologist

The winters of 1955-1956 and 1958-1959 are compared as to extent and severity of winter kills. The 1956 winter kill, was thought to be less extensive and less severe than that of 1959. The Cedar River, and it's tributaries, and the Iowa River were affected more by low water levels and pollution than other of the Eastern Iowa streams.

It is also proposed that winter kill is an important factor in determining species composition and relative abundance in stream fish populations, particularly in river impoundments.

Since undesirable species of fish were killed in the same proportion as they were represented in the entire fish population, the 1958-1959 winter kill should be temporarily beneficial.

Winter Fishing Success on Decatur Lake, Iowa, 1958-1959

by

DELMAR ROBINSON

Fisheries Biologist

A "spot-check" creel census was conducted on Decatur Lake in Monona County during the period of December 9, 1958 to February 27, 1959. This census was conducted to determine ice fishing success on one of the newly created "cut-off" lakes formed as a result of channel stabilization work on the Missouri River.

A total of 209 fishermen who had fished 341 hours were contacted. These fishermen caught 569 fish for an average catch of 1.67 fish per hour. Of the 569 fish recorded: 366 were sauger, representing 64.3% of the total catch; Crappies numbered 148 or 23.9% of the catch; and 50 Large Mouth Bass representing 11.7%. Five channel catfish were also caught completing the total.

Quantitative Creel Census of Several Iowa Lakes May - September, 1958

by

TOM MOEN

Fisheries Biologist

The six natural lakes censused on a short-term basis (May through September) in 1957 were again censused by quatitative methods in 1958. Two natural and one artificial lake were added to the census in 1958. During the five month census period these nine lakes, totaling 10,882 acres of fishing waters, were host to

195,758 fishermen who caught an estimated 1,326,000 fish at an average rate of 2.42 fish per hour.

Approximately 18 men fished a total of 50 hours per acre of water and caught 41 pounds of fish. Fishing success ranged from 0.60 fish per hour at Ingham Lake to 177 pounds per acre from Lost Island Lake. Bullheads made up over 75 per cent of the total catch from five of the nine lakes censused and accounted for over 86 per cent of the total number of fish caught from all the lakes. The expanded total of 546,000 hours of fishing on these nine lakes is estimated as representing about 2.5 per cent of the total hours of fishing in Iowa waters.

A Preliminary Report on The Increased Growth of Bluegills in a Southern Iowa Artificial Lake following Reduction in Population Density

by
JIM MAYHEW
Fisheries Biologist

Williamson Pond, a 27 acre state-owned artificial lake in Lucas County was used for an experimental management area in 1957-1958. The purpose of the project was to determine the effects of population manipulation on growth and physical condition of the adult bluegill population. The fish had been over crowded and stunted for three years. Prior to the population reduction an estimate revealed a population of 58,594 adult bluegills. Efforts to reduce the population in 1957 failed because of poor netting conditions. As an alternate plan the water volume was reduced to increase predation. In 1958 the population was estimated at 34,306 fish, a reduction of 48 per cent. Chemical treatment of two shallow bays further reduced this population by 32 per cent. Total reduction over the two year period was approximately 60 per cent.

Growth increments before the chemical treatment were extremely slow averaging 2.9, 1.3 and 0.8 inches for the first three years of life. Immediately following the reduction of the population in 1958 the growth increment increased to 1.8 inches. Coeffecient of condition also increase appreciably during the same period.

Results of the 1958 Iowa Deer Season

by
E. W. MUSTARD
Game Biologist

The 1958 deer season was state-wide in scope and was of the hunter's choice type. Six thousand shotgun permits, and 1,380 bow permits were issued.

A total of 2,891 deer were harvested, with gun hunters accounting for 2,141 bow hunters for 162, and the remaining 588 were taken by non-permit hunters (landowners and tenants).

Hunter card returns were received from 5,816 shotgun hunters, or 96.9 percent, while 1,357 bow hunters returned cards for a 98.3 per-cent return. The 5,570 gun hunters who hunted reported a hunter success ratio of 38.4 per-cent, while the 1,302 bow hunters who participated in the season had a 12.4 per-cent hunter success ratio.

Additional information was also obtained from the hunter card returns, and is summarized in the report: County hunted, hours spent hunting, deer killed, sex and age of deer killed, time killed (day and hour), county in which deer was killed, number of deer seen while hunting, and occupation of reporting hunter.

An Evaluation of the Winter Roadside Rabbit Census in Iowa

by
PAUL D. KLINE
Game Biologist

Results of 10 years' winter roadside counts of cottontails are presented. The survey is shown to be severely impaired by varying snow conditions in various portions of Iowa and from season to season. Snow cover at the time surveys were run increased numbers of cottontails observed. Varying snow conditions gives data which are not representative of actual rabbit populations. The writer believes winter counts merely duplicate information which is presently provided by summer surveys.

Waterfowl Bag Checks - 1958

by
JAMES G. SIEH
Game Biologist

Commission personnel reported checking 6,444 waterfowl hunters who had hunted 24,292 hours in 50 counties. These nimrods harvested 6,699 ducks and 680 geese. Sixteen species of ducks, mergansers, and four species of geese were taken. The Iowa hunter bagged one duck in 3.5 hours of hunting in 1958 indicating a slightly poorer than average duck-per-hour kill figure. Goose hunting was above average requiring 34.5 hunting hours afield to average one goose in the bag. Unsuccessful hunters averaged 2.9 hours in the field when checked in 1958.

The 1958 Quail Season

by
M. E. STEMPEL
Game Biologist

Data on the 1958 quail season were collected on cards furnished to conservation officers. Opening date of the season was November 1. Hunting was legal for 24 days in 11 counties, and 45 days in 52 other counties. Shooting hours were 8:30 A.M. to 4:30 P.M. Daily bag limit was six with 12 in possession.

Cards were made out for 403 parties which averaged 2.5 hunters. Forty five per-cent thought hunting was better than in 1957.

Highest number of coveys flushed was reported as 10 to 12 on one trip in Van Buren county. Other aspects of hunting also indicated excellent hunting success.

Officers reported that it was easier to collect party hunting information during the early part of the hunting period. Hunting success was 1.2 man hours per bird from November 1, through 15, and 1.6 hours per quail December 1, through 15. Hunters using dogs had better success than those not using dogs. Few men reported that they did not find quail.

Observed Sex Ratios as shown by the Winter Pheasant Count 1959

by
RICHARD C. NOMSEN
Game Biologist

Sex Ratios observed during the Winter Pheasant Count in 1959 resulted from favorable checking conditions and the excellent cooperation of conservation officers. A total of 74,078 birds were counted. The state-wide average of 3.1 hens per cock indicated a moderate harvest of 64 per-cent of the available roosters last fall. The most favorable harvest occurred in northeast Iowa where 78 per-cent of the ring-necks were removed. The kill percentage in northwest Iowa was 57 per-cent which was low for the state. Hunters in southwest Iowa bagged 73 per-cent of the cocks while results from the other districts remained similar to the state average.

Year-Round Creel Census of Three Iowa Lakes
1958-59

by
E. T. Rose
Fisheries Biologist

This report covers the results of the third year in which a complete-type quantitative creel census has been conducted on a year-round basis in the so-called "Iowa Great Lakes" area. Previously a spot census, or incomplete type had been operated for many years in these lakes, but due to inadequacies was abandoned in favor of the improved type.

Creel census of the quantitative type are the only means whereby a reasonable approximation of angler fish harvests, fishing pressure, basic production and management practices can be assayed. Census methods used in the past season (May 1, 1958 - Feb. 15, 1959) are identical to those of the previous two years. They were described in detail in previous reports (Rose, 1956-1958). Briefly, they consist of recording catch data of completed angling trips and expanding these to the calculated total number of anglers. The method involves a patterned series of daily counts of boat and shore anglers. Field data are processed by an electronic computor. Week-days, week-end days and holidays are calculated separately each month as base period averages. Longer periods would tend to bias expansions due to variations in seasonal angling success.

The lakes reported here include Spirit, East and West Okoboji. All are among the best fishing lakes in Iowa, and are subjected to rigid management practices and biological investigation.

Basic data from census on these lakes, from May 1, 1958 to February 15, 1959, are as follows:

Totals	Spirit	W. Okoboji	E. Okoboji
Number of Fish	181,587	443,443	137,778
Number of Pounds	132,531	241,350	75,830
Number of Trips	64,157	109,686	46,106
Number of Hours	195,647	378,232	167,425
Av. Fish Per Trip	2.8	4.0	3.0
Av. Fish Per Hour	0.93	1.17	0.82
Av. Pounds Per hour	0.62	0.64	0.45
Av. Pounds Per Acre	23.3	61.3	54.2

The most significant features of the census are included in commentaries on each lake with detailed totals and graphs.

SPIRIT LAKE (5,684 ACRES)

As in previous reports (Rose, 1957, 1958), the census data are divided into open water (spring, summer and fall) and winter, or ice fishing. Table 1. (Appendix), includes the principal data combined from the monthly calculations of week-days, week-end days and holidays.

Comparison with past censuses:

Although the census this year is basically similar in number and pounds of fish caught (see following table) to the previous two year's data, there were significant changes in the composition of the catch.

Census Season	1956-57	1957-58	1958-59
Number Fish	168,494	154,667	181,587
Number Pounds	124,640	119,389	132,531
Angler Trips	94,230	80,947	64,157
Fish per Hour	0.59	0.66	0.93

For example, in 1956, there were 22,000 pounds of perch caught from Spirit Lake. This decreased to 19,000 in 1957 and increased to 35,000 pounds in the 1958-59 season. Walleyes ranged from 34,000 pounds in 1956 to 47,000 in 1957 and 45,000 this year. Bullheads have decreased from 47,000 pounds in 1956 to 37,000 in 1957 and 34,000 pounds in the past season. Sheepshead have increased from 2,000 pounds in 1956 to 7,000 pounds this season, possibly reflecting increased abundance. White bass catch indicates a considerable recovery from their serious decline in the late 1940's. The data shows 1,500 pounds in 1956 as compared to about 3,500 during the past two seasons. Little change is indicated for the black basses and northern pike. Crappies show a significant decline in catch from 11,000 pounds in the 1957-58 season to less than 4,000 pounds this year.

Winter angling was considerably better than last year or the year before, ranging from 13,000 pounds in 1957 to 18,000 in 1958 to nearly 34,000 pounds in 1959. Open water angling had little variance in total numbers and weights during the past three years.

Table 2 (Appendix) includes a comparison of monthly angling pressure, average catch per unit effort, and the catches of the three most important species--perch, walleye and bullhead. It indicates (Fig. 1 -Appendix) that the catch per hour varied directly with the pressure throughout the season, with a lag in success considerably later than the pressure. This is doubtless due to the heavy catches of bullheads throughout August and the increasingly good perch fishing in September. As usual, just prior to freeze-up in November, angling pressure is lowest. Winter angling was exceptionally productive of perch and large walleyes (table 1 and 2, Appendix). Note the variance in average weight of open water and winter caught walleyes(1.4 - 2.8). It is evident that the summer anglers have the opportunity but are not harvesting this segment of large walleyes--many of which were from six to ten pounds.

Of the total catch, of all species 86 per-cent was taken during the open water period and 14 per-cent during winter. This is about the same as in the previous two years. In weight, 85 per-cent of the total pounds caught were composed of walleyes, perch and bullheads. Over 45,000 pounds of walleyes were caught--about the same as last season. This represents a harvest of about eight pounds per acre and should not be considered excessive. The total of 132,531 pounds of fish represents an angler harvest of 23.3 pounds per acre.

WEST OKOBOJI

This is the second year in which a complete-type census has been conducted on the lake. This provides some comparative data. In the previous year (1957-58), a calculated total of 361,079 fish were caught by 101,131 fishermen in 339,144 hours of fishing. Angling pressure was about the same this year; however, considerably more fish were caught.

Table 3, (Appendix) includes the major details of the census as compiled from monthly averages during the census year (May 1, 1958 to Feb. 15, 1959). A few comparisons may be cited to show the remarkably similar data with last year's report and some of the very divergent aspects. These are outlined as follows:

Species	Season 1957-58 Number	Pounds	1958-59 Number	Pounds
Crappie	10,216	5,807	9,026	4,122
Perch	128,832	66,844	122,216	52,010
Walleye	15,797	25,919	15,720	24,191
L.M. Bass	640	1,150	768	1,162
S.M. Bass	3,339	6,740	3,123	7,064
Bluegill	58,094	29,271	93,205	32,780
Sheepshead	8,216	12,921	11,632	21,804
Bullhead	122,802	82,533	179,235	84,386
Total Anglers	101,131		109,686	
Total Hours	339,144		378,232	

The catches the past two years are substantially the same except for the vast increase this year in numbers of bullheads, bluegills and the weight increase in sheepshead during the past season.

The peak in angling actually occurred in July and August. Bullheads, perch, bluegills and walleyes were the most abundant species in the catch. These data are included in table 4 and figure 2 (Appendix). As at Spirit Lake, catch-per-unit effort varied nearly directly with the pressure. A sustained lag in catches over 1.0 fish per-hour occurred following the rapid decline in angler trips after September. This is probably customary due to the good perch and bluegill angling in the fall. The slight increase in catch per hour in February was due to the excellent bluegill angling in Emerson Bay.

Winter angling was somewhat better this year with about 45,000 fish caught as compared to about 31,000 in the previous season. Nearly 10 per-cent of the total catch was taken during the past winter, (table 4, Appendix) and 8.5 per-cent during the previous winter. Winter angling pressure declined from about 18,000 to about 15,000 trips. Summer bullhead catches remain high, reflecting in part the magnitude of the population. The catch was 57,000 fish more than last year; however, the weight increase was only about 2,000 pounds. Open water anglers caught fish at the same rate as last year, 1.2 fish per hour. Winter angling increased from 0.44 to 0.81 fish-per-hour this year.

EAST OKOBOJI

The basic details of the census on this lake are contained in Table 5 (Appendix). This was the second consecutive season of quantitative creel census on this lake. Like last year, there was very little winter angling, and the catch data obtained were included with the adjoining West Okoboji.

The total catch was about one-half that of the preceeding year, however, the decline was largely in bullheads--from 245,000 fish (133,000 pounds) to 116,000 (49,000). Last year bullheads made up 91.5 per-cent of the catch as compared to only 84.1 per-cent in the past season. Walleyes made a substantial increase--from 6,500 pounds to 16,300 pounds. Significant increases were also noted in crappie, sheepshead and channel catfish (the first record of this species from these lakes).

Drought conditions seriously lowered the lake levels, particularly from the "narrows" to the head of the lake. Since this is the shallowest portion, boat travel was virtually impossible after mid-summer and doubtless influenced the reduced catch of bullheads particularly. Geological survey records show the lake to be about 4.5 feet below crest elevation, indicating the lowest level since 1901. Dissolved oxygen determinations indicated a probable heavy kill in the shallow areas above the narrows.

Discussion

Some aspects of the creel census program, particularly the year-round projects, should receive some discussion and consideration in our over-all fisheries program. It is sometimes felt that perhaps this could be utilized for other projects, or that it is historical data anyway and therefore, of no real value. Arguments to support the program are not the purpose of this discussion. However, it should be pointed out, that without these data we have no means of appraising management programs for which vast investments are made annually. Also, a means of informing the public concerning productivity is available which otherwise can not be determined. Furthermore, records become increasingly valuable to support the department in emergency situations, that occur periodically.

Data without proper interpretation can be dangerously manipulated. For instance, winter angling is still frowned upon by some summer vacationers who feel that the winter catch of fish may reduce his summer success. An uncritical interpretation of the census data might support this. As an example, on West Okoboji the spot censuses from 1951 to 1955 (Rose, 1955) showed an average of 12,000 perch caught each winter by an average of 6,000 interviewed anglers. It might be contended that if perch were maintaining their population densities and were caught proportionately, mathematically the complete census this past winter should have included 30,000 perch instead of only 16,000. If 6,000 anglers caught 12,000 perch, 15,000 anglers (calculated total winter anglers) should have taken 30,000 perch ($\frac{12000}{6000}$ x 15000). Also, the average weight of perch in the catch has declined from about 9 ounces to about 6 ounces. Now, by the same token, we should have caught only 3,150 walleyes this past winter instead of 5,000 ($\frac{1245}{6000}$ x 15,000) where 1,245 was the average number of walleyes caught each winter, from 1951 to 1955. Or only 135 crappies instead of 1,400. Variances of this nature must be carefully evaluated and interpreted, with no one species selected from context to reflect change or success. Many anglers observed huge schools of large perch during all the past winter that simply would not bite. Consequently, many perch fishermen shifted to bluegill angling with good results (practically no bluegills were taken in the first five winters of census). Consequently census records per se do not accurately reflect population densities or explain changes in catch composition.

The inportant aspects merely include the number of anglers, the hours of recreation, and the degree of success attending their efforts. Three Iowa lakes of only 11,000 acres produced over three-fourths of a million fish (250 tons) in a calculated one-fourth million fishing trips this past season. This represents a lot of recreation (3/4 million hours) and is worth the effort to evaluate it annually.

Bibliography

Rose, E. T.
1956. The quatitative creel census methods at Spirit Lake. Quarterly biology reports; 8, No. 2, pp. 21-30.

1958. The 1957-58 quantitative creel census of Iowa Lakes including new census technique. Quarterly biology reports; 10, No. 1, pp. 33-43.

APPENDIX

Table 1: Angler Harvest of Fish From Spirit Lake Open Water and Winter (May 1, 1958 - Feb. 15, 1959)

	Open Water		Winter				Angling Percentages	
Species	Number	Pounds	Number	Pounds	Total Number	Total Weight	Open Water	From Ice
Crappie	5,658	3,127	1,258	785	6,916	3,912	81.5	18.5
Perch	49,421	25,920	15,443	9,281	64,864	35,201	76.2	23.8
Walleye	16,716	23,070	8,397	21,936	25,113	45,006	66.6	33.4
Bullhead	73,092	33,515			73,092	33,515	100.0	0.0
L. M. Bass	626	1,090	422	771	1,048	1,861	59.7	40.3
S. M. Bass	82	166			82	166	100.0	0.0
White Bass	4,692	3,171	82	70	4,774	3,241	98.3	1.7
Northern Pike	478	1,918	190	728	668	2,646	71.6	28.4
Sheepshead	4,736	6,804	16	65	4,752	6,869	99.6	0.4
Bluegill	278	114			278	114	100.0	0.0
Totals and Percentages	155,779	98,895	25,808	33,636	181,587	132,531	86	14
Total Anglers	52,130		12,027		64,157			
Total Hours	155,928		39,714		195,542			
Average Fish/Trip	2.8	(Grand Total)						
Average Fish/Hour	0.62	(Grand total)						

APPENDIX

Table 2. Monthly Comparison of Angling Pressure and Catch Per Unit Effort With the Three Most Important Species at Spirit Lake.

SPIRIT LAKE

MONTH	ANGLERS	FISH PER HOUR	PERCH	WALLEYE	BULLHEAD
May	6,623	.67	435	2,061	5,183
June	11,285	.74	4,822	5,473	12,620
July	13,590	.80	9,181	6,370	14,806
August	11,458	1.44	11,306	2,089	32,264
September	5,748	1.27	13,623	319	7,092
October	3,052	1.19	9,579	388	1,127
November	374	.71	475	16	
December	7,503	.80	13,448	5,359	
January	4,065	.45	1,927	2,808	
February	459	.21	68	230	

* table 3 next page

APPENDIX

Table 4. Monthly Comparison of Angling Pressure and Catch Per Unit Effort With the Four Most Important Species.

WEST OKOBOJI

MONTH	ANGLERS	FISH PER HOUR	PERCH	WALLEYE	BULLHEAD	BLUEGILL
May	7,221	.84	1,628	931	14,373	2,111
June	15,046	1.38	9,618	2,104	38,911	15,311
July	21,666	1.33	10,759	2,004	53,880	23,177
August	21,764	1.24	15,063	1,318	47,539	14,623
September	15,234	1.15	28,489	1,549	18,072	12,442
October	9,401	1.22	27,417	1,637	5,368	5,086
November	4,482	1.17	13,195	1,066	1,092	137
December	6,337	.93	6,337	2,129		9,714
January	6,675	.66	8,914	2,458		5,358
February	1,860	1.01	175	524		5,246

APPENDIX

Table 3. Angler Harvest of Fish From West Okoboji Open Water and Winter (May 1, 1958 - Feb. 15, 1959)

Species	Open Water		Winter		Total	Total	Angling Percentages From	
	Number	Pounds	Number	Pounds	Number	Weight	Open Water	Ice
Crappie	7,634	3,495	1,392	617	9,026	4,122	84.6	15.4
Perch	106,169	45,607	16,047	6,403	122,216	52,010	86.8	13.2
Walleye	10,609	13,953	5,111	10,238	15,720	24,191	67.4	32.6
Bullhead	179,235	84,386			179,235	84,386	100.0	0.0
L. M. Bass	579	1,017	189	255	768	1,162	75.4	24.6
S. M. Bass	3,041	6,881	82	183	3,123	7,064	97.3	2.7
White Bass	1,845	1,464	249	355	2,094	1,819	88.1	11.9
Northern Pike	5,023	9,600	1,401	2,312	6,424	11,912	78.2	21.8
Sheepshead	11,632	21,804			11,632	21,804	100.0	0.0
Bluegill	72,887	26,435	20,318	6,345	93,205	32,780	78.2	21.8
Totals and Percentages	398,654	214,642	44,789	26,708	443,443	241,350	90.1	9.9
Total Anglers	94,814		14,872		109,686			
Total Hours	322,974		55,259		378,233			
Average Fish/Trip	4.0 (Grand Total)							
Average Fish/Hour	1.17 (Grand Total)							

APPENDIX

Table 5. Angler Harvest of Fish From East Okoboji Open Water (May 1, 1958 - February 15, 1959)

Species	Open Water Number	Pounds	Percent of Total
Crappie	2,235	932	1.6
Perch	4,474	1,855	3.2
Walleye	9,318	16,366	6.7
Bullhead	115,906	48,746	84.1
L. M. Bass	227	591	.2
S. M. Bass	48	96	T
White Bass	421	145	.2
Northern Pike	108	216	.1
Sheepshead	3,163	5,734	2.3
Bluegill	1,842	858	1.3
Channel Catfish	36	291	T
Total Fishing	137,778	75,830	100.0
Total Anglers	46,106		
Total Hours	167,425		
Average Fish/Trip	3.0		
Average Fish/Hour	0.82		

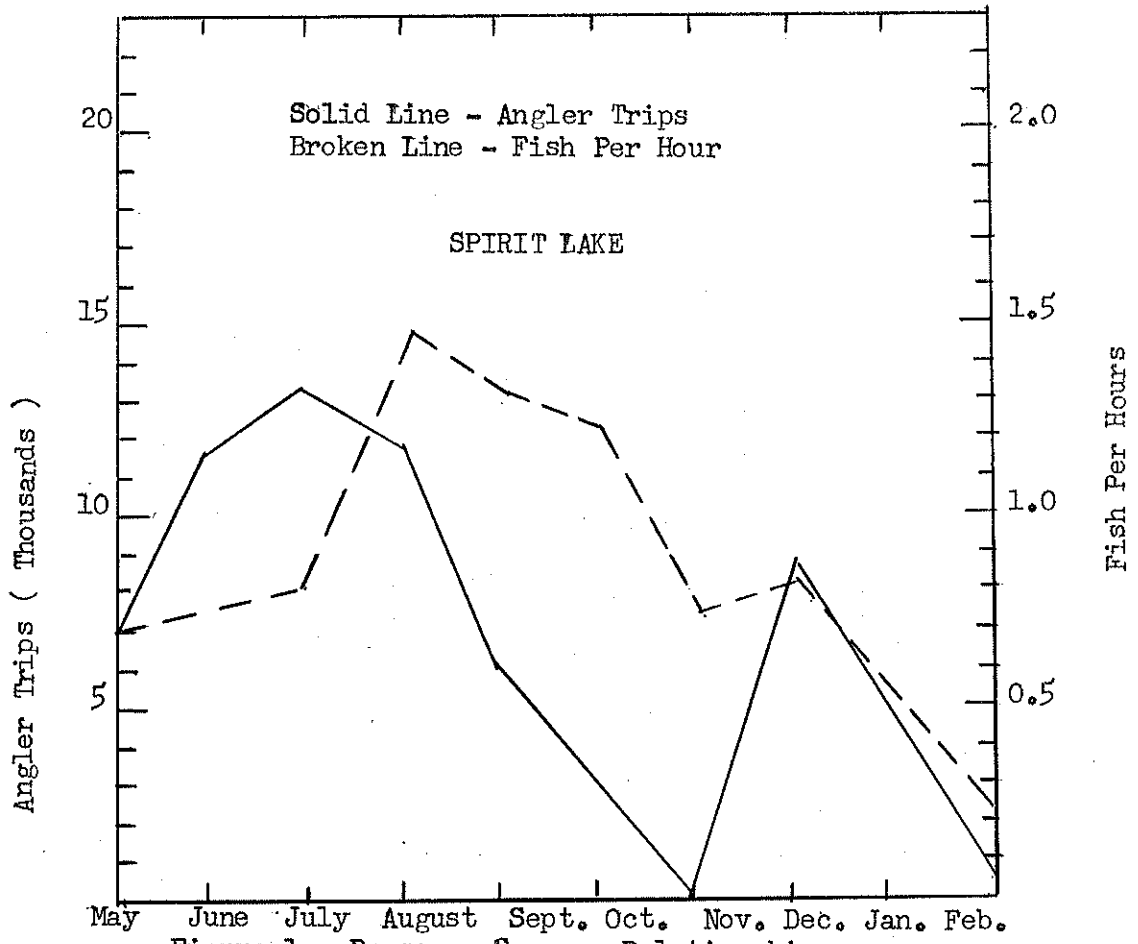

Figure 1: Pressure Success Relationship

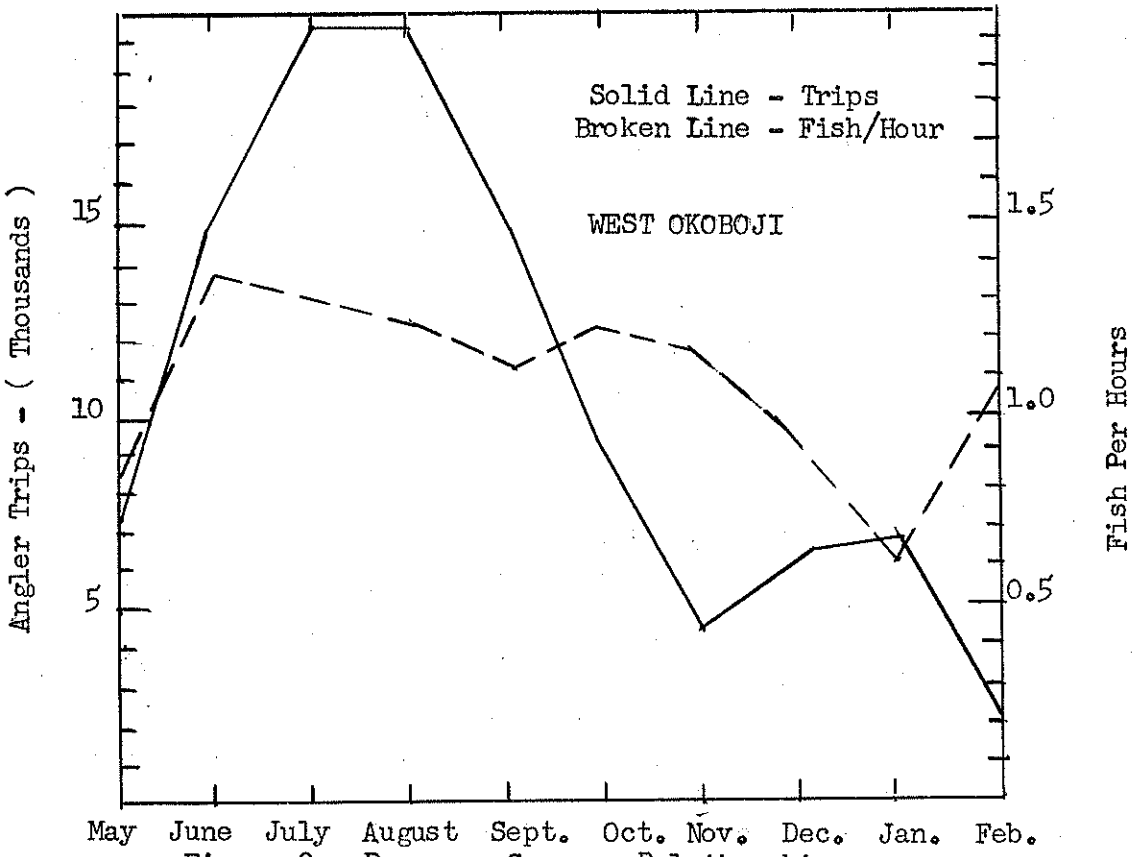

Figure 2: Pressure Success Relationship

Preliminary Report, Maple River Studies
1958
by
Harry M. Harrison
Fisheries Biologist

INTRODUCTION

The demand for water for all uses in Iowa has been increasing for many years. This would imply that water during certain periods is becoming scarce. In recognition of this fact, the 57th General Assembly passed a Water Law vesting control of water in this state within the prerogatives of the Iowa Natural Resources Council.

Among the various demands for water, withdrawal from streams for irrigation is a farm practice that is becoming increasingly popular on bottom land farms. Because of the large quantities of water required for the successful irrigation of an agricultural crop, much concern has arisen with regard to the detrimental effects of irrigation upon stream sport fishing. In an effort to rationalize the significance of this concern, studies designed to determine the effect upon fish life of major withdrawals of water from streams were initiated in several areas in 1958.

The Maple River in Western Iowa was one of the streams chosen for scrutiny. It was selected primarily because it was known to be a source of supply for several irrigators, and because the amount of proposed irrigation was extensive enough to have a perceptable effect upon the volume of flow. This report will summarize the information assembled from that stream for the first year of study.

Due to the pattern and amount of rainfall in the Maple River Drainage, it did not become necessary to irrigate in 1958. For this reason, the type of information being sought did not materialize. However, work on the river during the year did provide basic information which will be extremely helpful in evaluating future data in connection with the problem at hand.

Our work on the Maple has been, first, to establish its use by anglers; and second, to gain an insight into its fishery potential. Use of the river has been studied by the techniques of interviewing long-time resident fishermen and of observing actual fishing and fishing sign along the stream. Fishery potential, on the other hand, has been and will continue to be evaluated on the basis of continuing stream surveys.

Stream Use

Before the recreational value of a body of water can be adequately appreciated, it is necessary to have an idea of what it has provided in the way of past recreation. To get this background, several (3-10) fishermen living in each of the seven major towns adjacent to the stream were interviewed. The interviews were general in nature, but designed so that it would be possible to formulate, in broad terms, what the angling history of the stream had been.

Generally, the answers obtained from the twenty-eight fishermen questioned revealed essentially the same things: (1) fishing in the Maple is extremely variable. (and ranges from good upon occasion to poor at other times;) (2) during the past five years, fishing was reported as good to excellent only during

1954 and 1955 - since then, and probably a reflection of the severe drought of 1956, it has been extremely poor; (3) fish caught from the Maple, in order of importance, include channel catfish, carp, bullheads, suckers, and occasional flathead catfish, and, rarely, northern pike; and (4) in addition, the stream has a long history of furnishing an abundance of bait minnows, but it has not been commercialized to much extent for this purpose.

From personal observations, fishing on the Maple River was unimportant in 1958. Only two fishing parties were encountered in twenty days of field work. Both were fishing bullheads; neither had any success. Fishing sign ordinarily left by fishermen (bait can, forked sticks, paths, tracks, etc.) was very light throughout the year.

Fishery Potential

This phase of the Maple River studies is based principally upon surveys conducted in 1958, but also includes some information gathered from the watershed in the early 1950's. A species list was compiled and is given in Table 1, which also includes the relative abundance of each form. Figure 1 is a map of the Maple River with the collecting spots indicated by number, while Table 1 locates the collecting stations geographically and also gives the devices used in making the collections.

Carp and channel catfish are the species of principal significance. They received more attention than did the other fish inhabiting the Maple. Carp and catfish studies were primarily designed to relate their populations with the flow of the stream. The technique used involved population determinations at monthly intervals from May through September. Except for September, when chemicals were employed, populations were determined by the use of a 230 volt a.c. shocker. The area selected for study was that reach of the Maple lying east of Highway 175, south of the town of Mapleton. This stretch was selected because a government gaging station, located at the upstream end of the area, which would provide a reliable record of the flow of the stream.

Data gathered by shocking are at times subject to considerable error. However, conditions prevailing in the Maple River are such that error should be minimal for the stream is small and clear except for a short time following freshets. At the same time, cover areas are not extensive, and are separated by very shallow waters. Because of this, reliable counts could be obtained by shocking in the cover areas and noting the number and kind of fish that either floated to the surface or drifted into the shallows.

The pattern of flow in the Maple River during the time of study is depicted in Figure 2. This is based on five day average stage readings provided by the Iowa Geological Survey, Council Bluffs, office. Additionally, the figure shows the number of water areas over three feet deep by months in the first stream mile below the gage.

Water stages in the Maple were very stable and quite low in 1958. Five day average stage readings fluctuated less than two feet during May through September. This led to a gradual sanding full of the deeper water areas. By the middle of July, the majority of cover areas that had previously contained catfish and/or carp were sanded-in. This led to the disappearance of the fish that had formerly occupied them (table 3).

Coincident with the reduction in the catfish and carp population, the flow also had an effect upon size composition. Field observations revealed that the average size of both remained good until mid-July; after that, average size dropped precipitously. Table 4, shows the change in size composition for channel catfish, the only species upon which length measurements were made at regular intervals.

Summary

Work on the Maple River has not progressed to the point where final conclusions may be stated. None the less, our work on the stream is holding forth some things which have fundamental significance in the irrigation problem: (1) it has provided further evidence that fish populations are related to flow; (2) that large numbers of fish will move out of an area as the flow decreases; and (3) that certain species (catfish and carp) exhibit a threshold of tolerance with respect to the amount of flow below which they cannot exist.

Table 1: Station numbers, counties, location, and gear used to study fish in Maple River.

Station	County	Section	Twshp.	Range	Gear used	No. Coll.
1	Monona	10	T83N	R44W	¼"x4' x 20' Seine	1
					230 volt shocker	1
2	Monona	24	T83N	R44W	¼"x4' x 20' Seine	1
					230 volt shocker	1
3	Monona	4	T84N	R43W	¼"x4' x 20' Seine	1
					230 volt shocker	2
					Rotenone	1
4	Monona	26	T84N	R43W	230 volt shocker	5
					Rotenone	1
5	Woodbury	23	T86N	R41W	¼"x4' x 20' Seine	1
					230 volt shocker	1
6	Ida	24	T87N	R41W	¼"x4' x 20' Seine	1
					230 volt shocker	1
7	Ida	24	T88	R40W	¼"x4' x 20' Seine	1

Net collections were made prior to 1955. All other collections made in 1958.

Table 2: Species List Fish Maple River

Relative Abundance	Scientific Name	Common Name
A.	Dorosoma cepedianum (LeSueur)	Gizzard Shad
R.	Esox lucius Linnaeus	Northern Pike
R.	Ictiobus cyprinellus (Valenciennes)	Bigmouth Buffalo
C.	Carpiodes	Carpsucker & Quillback
R.	Moxostoma crythrurum (Rafinesque)	Golden Redhorse
C.	Moxostoma aureolum (LeSueur)	Northern Redhorse
R.	Hypentelium nigricans (LeSueur)	Northern Hogsucker
C.	Catostomus commersoni (Lacepede)	White Sucker
A.	Cyprinus carpio Linnaeus	Carp
A.	Semotilus atromaculatus (Mitchill)	Creek Chub
A.	Hybopsis gracilis (Richardson)	Flathead Chub
C.	Phenacobius mirabilis (Girard)	Plains Suckermouth Minnow
C.	Notropis cornutus frontalis (Agassiz)	Northern common shiner
C.	Notropis dorsalis (Agassiz)	Bigmouth shiner
A.	Notropis lutrensis Baird and Girard	Red Shiner
A.	Notropis deliciousus (Girard)	Sand shiner
C.	Hybognathus hankinsoni Hubbs	Brassy minnow
A.	Hybognathus nuchalis nachalis Agassiz	Silvery minnow
C.	Pimephales notatus (Rafinesque)	Bluntnose Minnow
A.	Pimephales promelas Rafinesque	Flathead minnow
A.	Ictalurus melas (Rafinesque)	Black Bullhead
C.	Ictalurus punctatus (Rafinesque)	Channel Catfish
R.	Micropterus salmoides (lacepede)	Largemouth bass
C.	Lepomis Cyanellus Rafinesque	Green Sunfish
C.	Lepomis humilis (Girard)	Orangespotted sunfish
R.	Pomoxis annularis Rafinesque	White crappie
R.	Stizostedion vitreum vitreum (Mitchill)	Walleye
R.	Stizastedion canadense (Smith)	Sauger
C.	Etheostoma nigrum Rafinesque	Central johnny darter

Table 3: Channel Catfish and Carp Taken from Maple River in 1958.

Date	Method of Coll.	Large stream involved	No. Cat	Cat per mile	Cat per min.	No. Carp	Carp per mile	Carp per min.
May 5	Shocker 55 min.	1 mile	47	47.0	.86	101	101	1.84
June 18	Shocker 30 min.	1 mile	96	96.0	3.20	207	207	6.90
July 15	Shocker 90 min.	3 mile	53	18.0	.59	179	59	1.99
Aug. 19	Shocker 150 min.	6 mile	40	6.6	.27	154	25.6	1.03
Sept.19	Rotenone	6 mile	3	.5	---	88	14.6	---

Table 4: Length-Frequency, by Months Channel Catfish, Maple River 1958.

	% population in length group				
Month	May	June	July	August	September
No. Catfish in Sample	43	47	51	27	3
Size Group, Total Length in Inches					
6 - 7.9	7	2	6	74	100
8 - 9.9	21	32	16	7	--
10 - 11.9	37	36	45	4	--
12 - 13.9	28	28	24	7	--
14 - 16.9	2	2	6	7	--
16 - 17.9	5	--	4	--	--
18 - ----	--	--	--	--	--

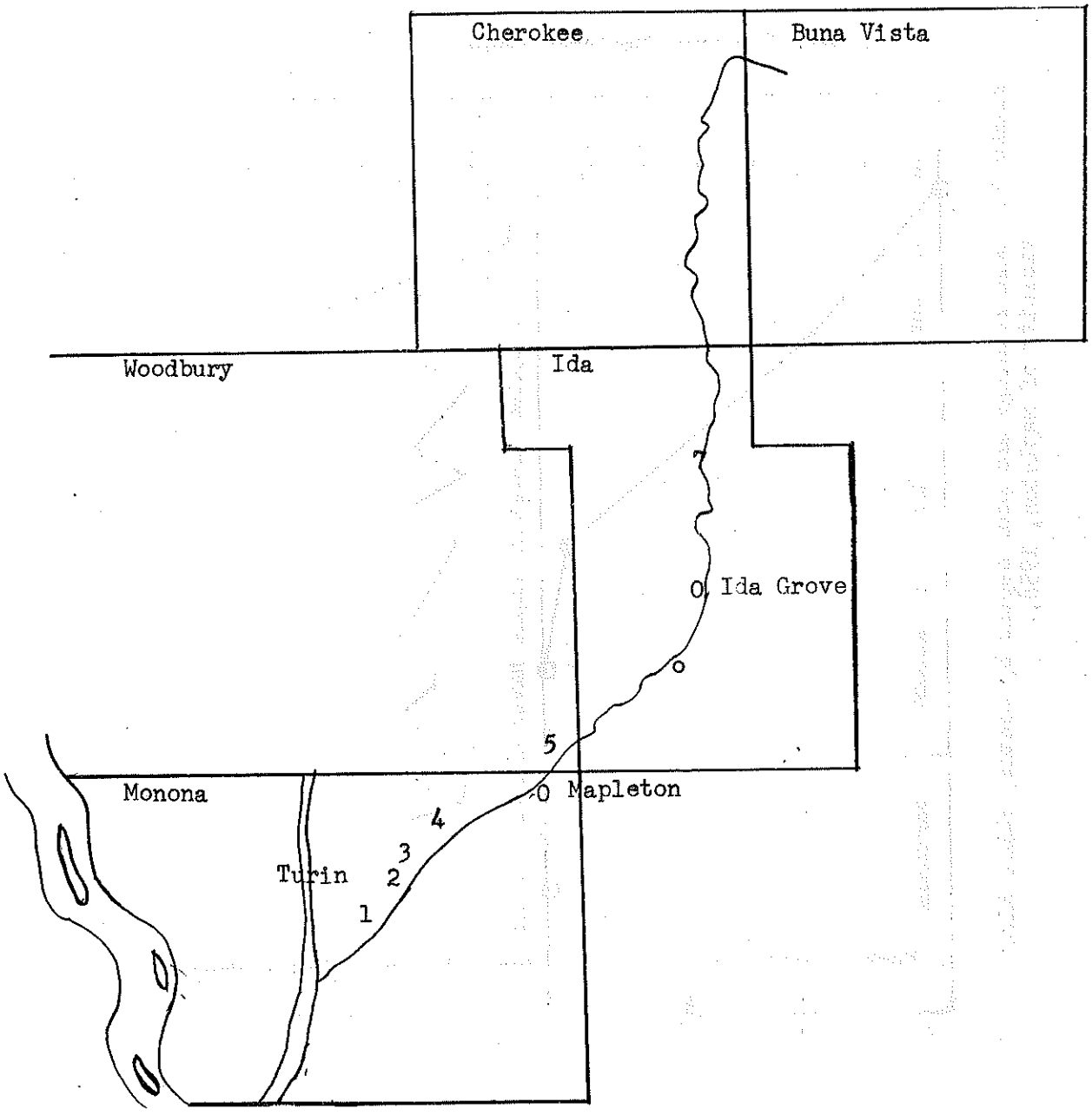

FIGURE I. Map of Maple River, collecting stations are indicated by number.

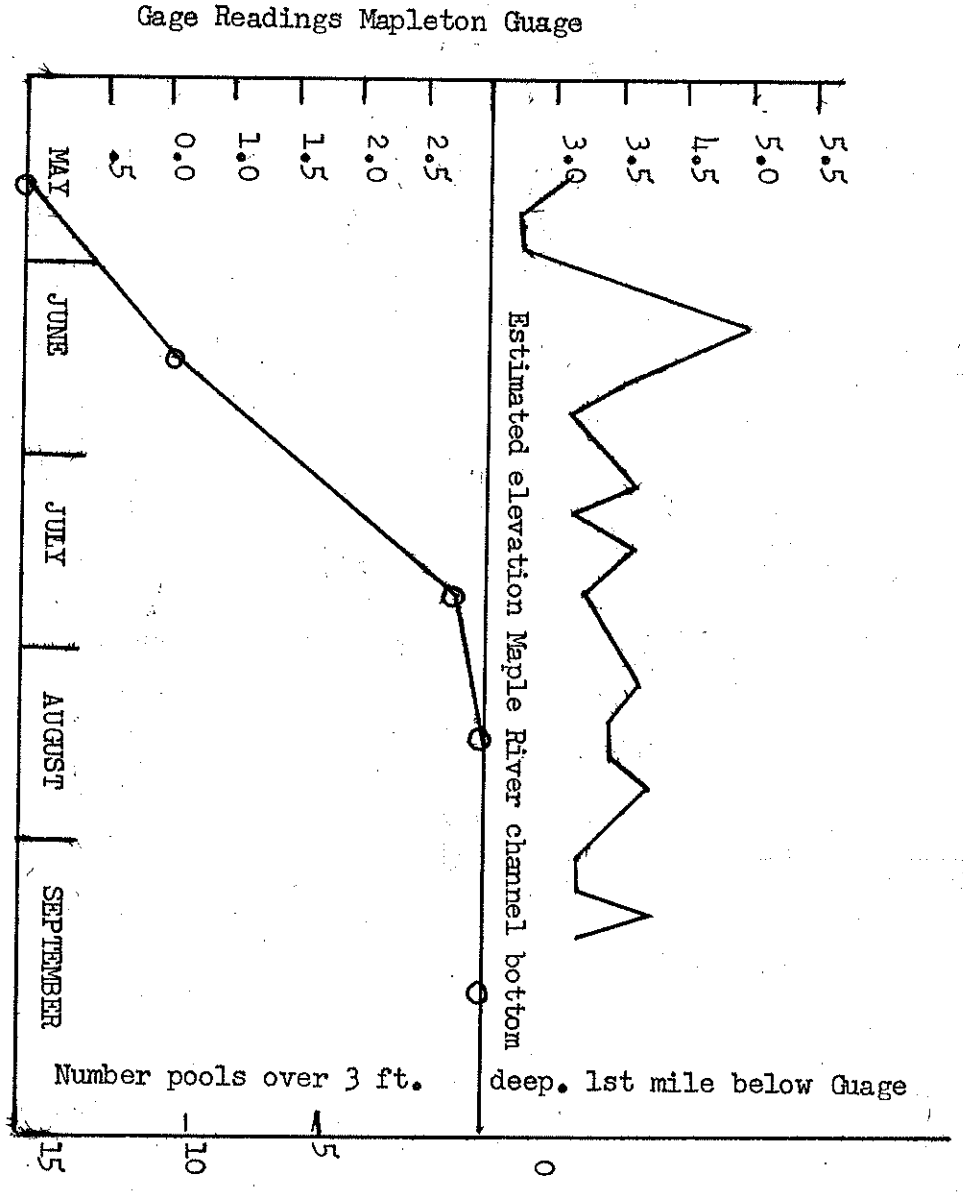

FIGURE 2: Gage readings and pool depths by months, Maple River vicinity of Mapleton, 1958.

Inland River Creel Census and Angling Evaluation
Southeast Iowa, 1958

by
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Anglers on the lower reaches of the Iowa, Cedar, Wapsipinicon and Des Moines rivers were contacted by creel census clerks during the summer and fall of 1958. The contacts were made during the first and fourth week in July; the second week in August; and the second week in September. One clerk covered the Wapsie from Anamosa to its mouth, and the Cedar from Cedar Rapids to its junction with the Iowa. A second clerk contacted anglers on the Iowa River from Iowa City to its junction with the Mississippi, and the Des Moines River from Ottumwa to Keokuk.

Conservation officers furnished annotated maps indicating areas of angler concentrations in each county and the clerks were instructed to "hit" each of these areas either going up or down the river. Since these rivers all drained different portions of the state and varied in drainage size, they were subject to different physical and climatic variables. Thus, a two-inch rain in one watershed could conceivably not affect the other three rivers. This partly accounts for the small number of contacts on the DesMoines River which was at a high, turbid stage most of the summer.

Census Data

On the Wapsipinicon River, six stations were checked on each travers with 75 per-cent of the pressure being localized immediately below the Anamosa dam. On the Cedar River 17 concentration points were checked periodically. The data indicates that 48 per-cent of the angling pressure occurred in the tailwaters of the Palisades dam and 16 per-cent in the city limits of Cedar Rapids.

Poor angling conditions, as mentioned previously, prevented establishing patterns of pressure on the Des Moines River. However, of the 16 spots checked on the Iowa River, it was determined that 54 per-cent of the angling took place at the Iowa City dam.

In making the contact in the field, the clerk established the distance the angler travled to fish; the number of trips made per year; type of contact (boat, bank, wader); value of his gear; species of fish being sought; angler age and sex, as well as the number and type of fish caught and hours fished.

Most anglers contacted were actively fishing for catfish. Those that "just came to fish" were next, followed by the carp fishermen. The angler evinced little interest in other species, undoubtedly due to their scarcity in these reaches of the streams (Table 1).

Despite the fact that the creel census was made in the lower reaches of these inland river, the lack of impounded waters in that area was apparent in the few boats used by anglers, since only one of nine used a boat. (Table 2).

Most of the anglers contacted were middle aged males, 35 to 50 years old (Table 3).

In the lower reaches of these inland rivers, the accruing effects of the upstream environmental stresses are manifest. Generally speaking, the habitat is the least variable and least capable of supporting a complex population of fish. Immediately below the last dam in these rivers, the habitat is usually at its best. It is here, and occasionally at the mouths of these rivers, where the angler has a choice or the potential of creeling more than two or three kinds of fish, usually the most tolerant of the river species. This complexity of species usually found at the

mouths of these inland rivers is the result of movement of Mississippi River species out of their home river into these tributaries.

Three species of fish, the channel cat, carp, and the bullhead make up 95 per-cent of the fish caught in the lower reaches of these rivers (Table 4). These species are three of the most tolerant to adverse conditions of any on the state fish list.

Economic Evaluation of Fishery:

The day is fast drawing to a close when the professional conservationist can disdain to attach an economic value to hunting or fishing. Peace of soul, communing with nature, and the thrill of a savage strike on a lure, are a nebulous and often futile line of defense against the dollar values of agricultural, municipal, or industrial encroachment on public waters.

In line with this philosophy on recreational values, a dollars-and-cents evaluation of the actual expenses incurred in fishing these rivers was included in this project.

Since the anglers' home town was determined, and since he was asked how many trips he made to the river, it became a simple matter to figure his transportation expenses (Table 5). The replacement value of the gear the angler was using while fishing was amortized over a five-year period and miscellaneous expenses such as the cost of bait and license were added. Since most anglers were found to come from less than 60 miles away to fish, and usually brought their own lunch, no room or meal expense was added to their angling expenditures. The average river angler in this area made 5.4 trips per year.

To carry this one step further, if we assume that our sample of fishermen is typical of this particular area, we can set a total dollars-and-cents evaluation on the inland river fishery resources of this portion of the state. In 1957, there were 60,676 fishing (resident and non-resident) and combination licenses sold in the counties through which these rivers flow or which lie within 60 miles of one river or the other. If we use the state-wide estimate that 49 per-cent of these license holders fish in rivers, (Crossley Survey, Iowa, 1956) (This would be a minimum estimate for there are few artificial lakes in this area), and if we average out the per-river angler expenses for this area at $32.00 per license holder, we arrive at an annual expense of $951,392.00 This, in reality, is the evaluation put on these 313 miles of streams by anglers giving a per-mile average of $2,973.00; plus, of course, the intangible recreational value of the estimated 1,570 hours of fishing per mile of river.

Table 1: Type of Fish Sought By Anglers on Lower Reaches of Eastern Iowa Rivers.

Species	Cedar	Des Moines	Iowa	Wapsie	Total	Angler Preference
Anything	105	12	40	46	203	39%
Bass	---	--	--	3	3	Tr.
Buffalo	---	--	--	1	1	Tr.
Carp	6	2	58	1	67	13%
Catfish	84	17	119	14	234	46%
Crappie	1	--	3	--	4	Tr.
Sheepshead	---	--	1	--	1	Tr.
Walleye	1	1	1	2	5	1%
	197	32	222	67	518	

Tr. = Less than 1%

Table 2: Angler Type in Sample Taken on Southeast Iowa Inland Rivers.

River	Boat Fishermen	Bank Fishermen	Total
Wapsipinicon	0	67	67
Cedar	15	182	197
Iowa	38	184	222
Des Moines	4	28	32
Total	57	461	518

Table 3: Sex and Age of Anglers Fishing Lower Reaches of Southeast Iowa Rivers.

Male			Female		
Age	No.	Percent	Age	No.	Percent
Teens	65	17	Teens	4	7
20-35	68	17	20-35	13	22
35-50	158	40	35-50	27	47
Over 50	104	26	Over 50	14	24
	395			58	

Table 4: Angling Success and Effort on Lower Reaches of Rivers in Southeast Iowa.

Species	Cedar	Des Moines	Iowa	Wapsie	Totals	% of Catch
Mooneye	2				2	Tr.
Sucker Species				1	1	Tr.
Carp	89	7	35	20	151	36
Bullhead Sp.	20	11	3	4	38	9
Channel Catfish	116	16	42	27	201	48
Flathead Catfish	3		1		4	1
White Bass	1				1	Tr.
Bluegill	1			2	3	1
White Crappie	5				5	1
Black Crappie	2				2	Tr.
Walleye	1				1	Tr.
Yellow Perch				1	1	Tr.
Freshwater Drum	4	1	5		10	2
No. Anglers Interviewed	197	32	222	67	518	
No. Unsuccessful Anglers	95	17	164	34	310	
No. Unsuccessful Hours	134.5	16.0	219.5	81.0	451.0	
No. of Fish Caught	244	35	86	55	420	
No. Success. Hours	254.5	40.0	120.0	81.0	495.5	
Fish/success Hours.	.96	.88	.72	.62	.85	
Fish/Anglers Hours.	.63	.63	.25	.31	.44	

Table 5: Inland River Creel Census Evaluation - Lower Reaches.

	No. Anglers Contacted	Av. Trips to river Angler	Total Dist. Traveled	Av. Travel. Expense Year (1)	Av. Cost of Gear Year (2)	Av. Misc. Costs Year (3)	Av. Total Per Angler Per Year
Wapsie	67	10.0	43,232	$22.60	$8.71	$ 7.00	$38.31
Cedar	197	4.2	93,018	15.82	6.78	4.10	26.70
Iowa	222	3.6	92,880	14.63	9.81	3.80	38.24
DesMoines	32	16.3	16,122	17.60	6.97	10.15	34.72

1. Based on 3½¢ mile (AAA Operation only costs).
2. Based on five-year depreciation schedule on estimated replacement value.
3. Based on average trips per year X 50¢ for bait, plus fishing license at $2.00.

Oxygen Depletion and Winter Fish Kills in Northeast Iowa Streams 1958 - 1959

by
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The past winter of 1958 - 1959 was more severe than the winter of 1955 - 1956 in respect to winter fish kills. Fall water levels were aided by some rains in the Iowa-Cedar watershed but ground water was low after several years of near drought conditions. An early freeze and continous cold weather in the upstream reaches of the rivers of N. E. Iowa resulted in the formation of ice cover over 36 inches in thickness in some areas.

Cleary, (1956) in summarizing the winter kill picture for the winter of 1955 - 1956, enumerated the fish kills that occurred during that winter resulting from oxygen depletion and the factors that affect fish survival in water with reduced dissolved oxygen content.

The oxygen depletion and resultant fish kills followed the same pattern and developed in the same general areas as in 1955 - 1956 but was more severe and extensive. The Cedar River, which is as major stream for angling from the Minnesota - Iowa boundary to below the Palisades-Kepler Park dam, was affected the most. Dissolved oxygen readings below 2 p.p.m. were obtained from a point 1/2 miles south of the Iowa-Minnesota State line to south city limits of Nashua, except for two very short sections of stream. Subsequent kills in these areas indicated that the dissolved oxygen dropped to more lethal levels in these areas even after opened to promiscuous fishing. As the winter progressed, the entire reach of the Cedar from the state line to the bridge at the east edge of the village of Plainfield in Bremer county, was opened to promiscuous fishing. The recent breakup of ice cover has confirmed estimates of very heavy winter kill throughout the entire area with literally tons of fish, mostly carp and quillback, in evidence along the stream and particularly in the impoundments at Mitchell, Charles City and Nashua.

The impoundment at Mitchell was the point from which the low oxygen spread progressively downstream. On December 31, 1958 a reading of 2.2 p.p.m. was obtained in deep water just above the Mitchell dam. By January 28, the reading at the bottom was 1 p.p.m. and at the surface 1.6 p.p.m.; within 24 hours fish were noticed in distress at the trash screen at the dam and at spring holes midway up the impoundment. The water level had fallen over 4 feet from dam creast level between January 5, and January 28, . In order to maintain "minimal flow" downstream, as required by law, the impoundment was being drained. Mitchell is the first power dam site on the Cedar in Iowa and there was no electricity generated from the week of Christmas 1958, until the first of April 1959.

St. Ansgar, which is a town located along the Cedar River 1 to 1 1/2 miles upstream from the head of the Mitchell impoundment, is a major source of organic pollution. In addition to the usual municipal wastes; grain wastes by the ton are dumped into the Cedar River from one of the few grist mills still operating in the state. The excessively high B.O.D., with little dilution and additional pollution from out of state sources, removed the oxygen from the stream as it progressed downstream to the Mitchell pool. By February 18, 1959 the area from State line to St. Ansgar was also depleted of oxygen.

The Iowa River froze to bottom above Belmond and the pollution entering at that point caused severe oxygen depletion from that point to the dam at Alden. This area was also open to promiscuous fishing. Water spilling over the dam at Alden and traversing a series of riffles was re-aerated and sufficient oxygen was maintained from Alden to the Iowa Falls dam to sustain fish life. Pollution from Iowa Falls contibuted to oxygen depletion which extended from Crossers Ford, just below Iowa Falls, to Union

near the Marshall county line. This area was also opened to promiscuous fishing.

The shellrock River was frozen to bottom in both deep pools and riffles above Nora Springs by February 2, 1959. Ninety five to 100 per-cent of the flow at Nora Springs was from the sewer outlet. Pollution from Nora Springs, Rockford and Marble Rock contributed to oxygen depletion in the Shellrock and it was opened to promiscuous fishing from its headwaters to the dam at Marble Rock (Table 1).

Table 1: Dissolved Oxygen in p.p.m. for Shellrock River, Winter of 1956 - 1959

Location	January	1956	February 1959
1. Kensett	6.0	1.2	Frozen to bottom
2. Rock Falls		2.6	Frozen to bottom
3. Nora Springs Dam		6.4	3.5
4. Nora Springs South Bridge			2.15* (2.1)
5. Fisher Bridge		3.2	1.7* (1.2)
6. Marble Rock Dam	11.8		3.1
7. Gates Bridge			7.3* (7.2)
8. Greene Dam	9.8/6.1* (9.8/4.8)	9.4	7.3/2.0* (7.2/1.6)
9. Clarksville Dam	10.2* (9.4)	9.0	4.8
10. Shellrock Dam			8.4

* Monthly averages of multiple determinations. D.O.'s in parenthesis are lows for month.

The Wapsipinicon River was depleted in oxygen and was opened for promiscuous fishing from U. S. #18 in Chickasaw county to the Frederika dam and from Iowa #93 near Sweet Marsh to the Littleton dam in Buchanan county. Areation from Frederika dam and several flowing wells maintained suitable oxygen levels to the Tripoli sewer outlet. Below Tripoli the oxygen was rapidly depleted until re-aereated at Littleton dam, (table 2).

Table 2: Dissolved Oxygen in p.p.m. for Wapsipinicon and Maquoketa Rivers Winters of 1956 and 1959.

Wapsipinicon River:

Location	January 1956	1959	February 1956	1959
U. S. #18 Bridge		1.4		
State #346 Bridge		1.6		
U. S. #63 Bridge		1.5* (1.0)		
Frederika Dam	2.2* (0.0)	4.4* (2.0)		
State #93 Bridge	4.4	5.9* (5.4)		
South End Sweet Marsh		5.2		
State #3 Bridge	5.0	2.0* (1.4)		
Seven Bridges	.1	1.8	1.7	
Fairbank Bridges	3.2* (1.7)	1.9* (1.0)	2.8	
Cutshaw Bridge	2.0	1.5* (1.0)	0.8	
Littleton Dam	3.6	4.2* (1.2)	2.2	2.8
Below Dam		5.6* (5.6)		
Otterville Bridge	8.6* (7.0)	6.2* (4.8)		4.4* (4.0)
Independence Dam 1.	13.8* (13.2)	5.5* (3.5)	9.6	3.7/1.5 (2.8/1.4
Independence Dam 2.		3.8		
Independence Dam 3.		4.0		3.0/2.6
Independence Dam 4.		7.7* (4.0)		5.4
Quasqueton Dam	16.4	7.2* (3.2)		2.9* (2.6)
Troy Mills Dam		7.7* (5.6)		5.4* (5.2)
Central City				5.4
Anamosa		7.8* (5.7)		3.0

Maquoketa River:

Quaker Mill Dam		10.8		10.6
Manchester Dam			10.8	10.2
Bailey's Ford	13.4	11.3* (11.2)	11.9	10.6
Delhi Dam	18.4	9.6* (9.4)	17.0	
Monticello Dam		7.6* (7.2)		8.2
Maquoketa Dam		10.8		

* Monthly average of multiple determinations. D. O.'s in parenthesis are lows for month.

(1) 3.7/1.5 Samples taken from mid-depth and at bottom, upper figure is p.p.m. at mid-depth, lower figure p.p.m. in sample taken from bottom.

The Wapsipinicon River exhibited the same pattern in both 1956 and 1959, with the section from U. S. Highway #18 to Frederika, and, the section from Tripoli south to Littleton, depleted of oxygen both years. Sweet Marsh along the Wapsipinicon near Tripoli, suffered a heavy kill in all three segments and in the reservoir. Readings from 0.0 to 0.6 p.p.m. of dissolved oxygen were obtained just prior to opening the Marsh to promiscuous fishing.

The Maquoketa River maintained a high dissolved oxygen content during both winters.

Cleary (op cit), credited low flows and organic pollution in combination with snow blanketed ice cover as being responsible for winter kill. He also pointed out that fish kills had occured during the open water period in most of these areas following periods of heavy industrial or organic pollution.

This view was borne out by the findings of this past winter. Diminishing gradients of dissolved oxygen occurred below major sources of pollution in all streams when sufficient determinations were made to be signicant.

The lower Cedar, from Cedar Rapids downstream, winter killed in 1956 but not in 1959. The Cedar River from Palo bridge to the Cedar Rapids dam was low in oxygen both winters and was opened to promiscuous fishing by as far as can be ascertained did not suffer a heavy winter kill during this past winter as it did in 1956. Low oxygen content was evident in the Cedar River at Mitchell in 1956 but was confined to the Mitchell pool and there was no extensive fish kill in 1956. In 1959 heavy kills extended from the Mitchell pool to Nashua in the Cedar (Table 3).

Table 3: Dissolved Oxygen in p.p.m. for Cedar River, Winter of 1956 and 1958 and 1959.

Cedar River:

Location	December 1958	January 1956	1959	February 1956	1959
State line					1.2
Otranto					0.4
St. Ansgar	7.4 (1)	3.6	5.5*(5.0)		0.8
Mitchell	7.2/2.2	0.4	4.3/2.2*(1.0)		
State #9 Bridge			1.4		
Seeber Bridge			4.0		3.4
Orchard Bridge					2.0
Idlewild Access (Floyd)					1.4
Cedar Crest Motel (Charles City)					1.5
Charles City Dam	7.2		2.6*(2.5)	4.0*(3.8)	1.2
Charles City (RR. Bridge)			4.7		3.2
Midway Bridge					1.4
Nashua Dam	7.4		7.4*(4.6)	2.8* (2.8)	2.1*(1.0)
Plainfield					3.9* (2.6)
Schleyburge Bridge					6.4
Waverly Dam	12.0	6.4	8.1*(7.7)		7.3* (6.4)
Janesville Bridge					7.5* (7.0)
Cedar Falls Dam		10.0	11.8	11.2	7.4* (6.8)
Waterloo Dam					9.8* (9.4)
Gilbertville Bridge		12.2	11.0	9.2	10.0* (9.2)
LaPorte City Bridge		5.8	8.1*(6.8)		7.6 (6.6)
Mt. Auburn Bridge		6.6*(4.8)		7.1*(6.6)	5.9* (4.8)
Vinton	14.8	5.7*(2.4)	5.8*(4.6)	4.6*(2.6)	5.6* (4.1)
Center Point Bridge			3.9*(3.8)	2.6	4.6
Palo Bridge			3.1*(2.9)		
Cedar Rapids (Ellis Park)		11.4	2.2*(2.0)		
Cedar Rapids Dam	15.4		2.4		
Sutliff Bridge					4.4
Palisades Dam		17.2	8.3*(6.2)		6.0
Cedar Bluff					3.5* (3.0)

* Monthly average of multiple determinations. D. O.'s in parenthesis are lows for month.

(1) 7.2/2.2 Samples taken from mid-depth and at bottom, upper figure is p.p.m. at mid-depth, lower figure p.p.m. in sample taken from bottom.

The lower Iowa River, from Chelsea to below Iowa City, was depleted of oxygen in 1956 but maintained sufficient oxygen to sustain fish life in 1959. The upper reaches of the River, from Alden to the headwaters, was depleted of oxygen in both 1956 and 1959, and was opened to promiscuous fishing both years (Table 4).

Table 4: Dissolved Oxygen in p.p.m. for Iowa River Winters of 1956 and 1959.

Iowa River:

Location	January 1956	1959	February 1956	1959
Klemme		11.0		Frozen to bottom
Goodell		7.2		Frozen to bottom
Belmond Dam		4.5* (2.1)		
Rowan		3.5* (2.1)		
Dows		3.5* (2.0)		
Alden Dam		2.3* (2.1)		
Stone House		8.3		7.4* (7.2)
Iowa Falls Dam		7.2		7.8
Crosser's Ford				4.0
Eagle City Bridge				3.2* (2.0)
Steamboat Rock Dam				1.9* (1.4)
Eldora Dam	7.5	6.2* (5.4)	7.0	3.9* (2.6)
Union Bridge				4.9* (3.7)
Marshalltown #14 Bridge		8.6* (8.4)		4.6* (3.8)
Marshalltown Dam	9.1			4.0
Tama #U.S. 63 Bridge	8.4	10.0* (8.6)	1.6	6.1* (4.0)
Belle Plaine Bridge		12.2		5.3* (4.0)
Marengo		12.8		6.8* (5.0)
Coralville Reservoir		10.2		
Coralville City Dam			1.6	5.1* (4.0)
Iowa City Dam			6.6	5.8* (4.2)

* Monthly average of multiple determinations. D. O.'s in parenthesis are low for month.

The small streams in North East Iowa were also seriouly affected by the severe winter. Many were frozen to bottom in their upper reaches and several are known to have suffered oxygen depletion. Plum Creek in Chickasaw and Bremer county was depleted of oxygen from Fredericksburg to the dam at Sweet Marsh; one mile upstream from Fredericksburg a reading of 8.2 p.p.m. was obtained, a sample taken one mile downstream from town showed 0.0 p.p.m. oxygen content.

The Little Cedar River suffered a heavy winter kill from the impoundment at Stacysville to its junction with the Cedar. Low oxygen content from samples, taken at several locations from Stacyville to Nashua and dead fish at every hole opened, indicated a heavy kill when visited on the 26 February 1959.

Visual observations of Commission personnel indicate a heavy kill in the Vernon Springs impoundment of the Turkey River near Cresco and some kill on the upper Wapsipinicon and upper reaches of the Upper Iowa River.

Oxygen determinations on samples taken from the Upper Iowa River on February 23, in the Decorah area indicate probable winter kill. A sample taken above Decorah contained 1.5 p.p.m. D. O., one at the lower dam 1.2 p.p.m.

Prior to this winter it was the opinion of many, that stream sections endowed with flowing springs were immune to winter kill. This winter, fish crowded into the Iron Springs area, between Mitchell and Highway #9 west of Osage, and died or were taken by fishermen. Fish kills occurred in other spring fed areas also.

It is the authors contention that winter kill is much more prevalent than heretofore proposed and that the scarity of large fish of all species in certain stream sections and impoundments as evidenced during the past several years is a result of winter kill. Selective-winter kills also reduced the desirable to undesirable fish ratio and probably account for the failure of fish stocking in otherwise suitable habitat, particularly in impoundments. It is also probable that pollution-induced low oxygen content during summer low water periods cause species requiring high oxygen levels and/or low carbon dioxide tensions to move from these impoundments. Since proper management of the many rivers would be affected by these-, phenomena, they should be investigated more thoroughly.

Since the wide-spread and severe winter kills in the Iowa-Cedar drainage eveidently destroyed rough fish in the same proportion as they were represented in the entire fish population their efforts will be temporarily beneficial.

Literature Cited:

Cleary, R. E., 1956 — Oxygen Depletion and Winter Fish Kills in Northeast Iowa Streams - 1956. Iowa Qtrly. Biol. Repts., April 1956.

Winter Fishing Success on Decatur Lake 1958 - 1959

by
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In an attempt to appraise a portion of the sport fishery potential of the Missouri River, a creel census project was initiated in September of 1958. The Project was designed as a "spot-check" type of creel census and involved fishermen interviews in the field at unscheduled intervals throughout the year. Most important data sought in this census will be catch per unit of effort and species composition of the catch. Other information such as bait used, principle species fished for, miles driven and estimated value of fishing gear will be recorded.

This report will cover only the ice fishing activities on Decatur Lake located in Monona County near Onawa, Iowa. This is in response to the tremendous interest and desire for information concerning the ice fishing in the newly created "cut-off" lakes of the Missouri River.

Decatur Lake was created in 1956 as a "cut-off" from the relocated channel when the U. S. Army Corps of Engineers straightened Tieville Bend on the Missouri River in Monona County. This is the site of the controversial "dry-land" bridge of a few years ago.

While Decatur Lake is not directly connected with the Missouri River, it is separated from the main channel by a single rock dike along the west side. This dike is loosely constructed and readily allows a lateral passage of water between the lake and the river. Consequently, the water level of the lake is subject to the fluctuations of the Missouri River as the Corps of Engineers regulate the water level as an aid to navigation. During the summer navigation season the lake has a surface area of approximately 1000 acres. In winter months, commencing around November 1, as the Engineers drop the water level in the river, the lake is reduced to a surface area of approximately 425 acres.

Maximum summer depths of the lake are 35 feet, with an average depth of eight feet. Winter depths are five to six feet less.

Winter fishing started in Decatur Lake on December 9, and lasted until the middle of February. During this period 209 fishermen were contacted and their catches checked. As shown in Table 1, the average fisherman caught 1.67 fish per hour.

Table 1: Angler Success for Months of December - March, 1958 - 1959, Decatur Lake.

Fishermen Contacted	Total Hours Fished	No. Fish Caught	Fish Caught Per Hour
209	341	569	1.67

Early winter catches were almost exclusively sauger with many limit catches. As the season progressed, crappie and largemouth bass were more frequently encountered in the catch.

Table 2: Species Composition of the Catch

Species	Number	Per Cent of Total
Sauger	366	64.30
Crappie	148	23.90
L. M. Bass	50	11.70
Channel Catfish	5	.01

Of the 209 fishermen contacted, 96 were asked how far they had driven to fish in Decatur Lake. Ninety of the fishermen, or 94% of those asked, were classified as "local", having driven less than 15 miles one way to fish. The remainder had driven less than 100 miles, mostly from Sioux City, to fish.

Discussion

When the Missouri River is lowered six feet on November 1, of each year at the end of the navigation season, Decatur Lake is reduced by over 50 per-cent of its summer area. Of these 425 remaining acres, approximately 200 acres are frozen to the bottom or very nearly so. This has the effect of crowding the entire fish population of a 1000 acre lake into 200 acres of deep water, thus making them fairly vulnerable to the ice fishermen.

Ice fishing was good in Decatur Lake in 1958 - 1959 as the 1.67 fish per hour indicated. However, many fishermen indicated that in 1957-1958, the first season of ice fishing, their fishing was much better with a greater take of sauger.

More work is needed to evaluate the effect of an intensive ice fishery upon a concentrated fish population such as is found in Decatur Lake during the winter months.

Quantitative Creel Census of Several Iowa Lakes May - September, 1958

by
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Fisheries Biologist

Quantitative creel census techniques were again employed to obtain estimates of total fishing pressure, total harvest, and fishing success on nine lakes during the summer of 1958. The census of three major lakes having a year around census will be reported on by E. T. Rose.

The method of gathering and processing data has been described in detail by E. T. Rose in previous seminar reports, only a very brief summary of the method will be presented in this paper.

Method:

Each of three census clerks were assigned three lakes. Each clerk followed a carefully planned schedule as to what lake he would check and at what time he would make his fisherman counts and interviews. Special consideration was given to week-end days and to early and late fishing periods of each day in order to sample an adequate portion of the fishing each month. All boats and all shore fishermen were counted every two hours during any one eight hour census period. Between these counts the clerk conducted interviews with fishermen who had completed their fishing trip. This interview supplied the data necessary for calculation of the various statistics of measurement such as fish per hour, fish per man, total fish, total hours, etc. through the use of an IBM 659 Data Processing Machine.

Lakes Censused and General Results:

Six of the nine lakes censused during the summer of 1958 were also sampled in the same manner during the same period of five months (May through September) in 1957. The three lakes added to the census were Clear Lake in Cerro Gordo county, Beeds Lake in Franklin county, and Lake Cornelia in Wright county. The six lakes censused in 1957 and 1958 include: Lost Island, High, Ingham, Storm, Black Hawk, and North Twin. These nine lakes have a combined surface area of 10,882 acres.

During the five months census period these nine lakes were fished by 195,758 fishermen who caught 1,326,000 fish at an average rate of 2.42 fish per hour (Table 1). The average acre of water supported approximately 50 hours of fishing during the census period. Although 50 hours per acre over a five month period would be considered as a rather low fishing pressure there were individual lakes the supported considerably higher pressure. Beeds Lake had 280 hours per acre and Lost Island 170 hours per acre of fishing over the census period.

Table 1: Basic Catch Data For Nine Lakes Censused From May Through September 1958.

Name of Lake	Area of Lake (Acre)	Total Fish Caught	Total Pounds Per Acre	Total Fishing Trips	Average Fish Per Hour
Lost Island	1,260	751,644	177	67,799	3.56 *
High	467	7,138	7	2,611	1.49 *
Ingham	421	5,910	5	3,645	.60 *
Storm	3,000	188,063	16	11,733	6.76 *
Black Hawk	957	85,422	60	25,635	1.63
North Twin	570	55,292	54	15,150	1.74
Clear	3,643	178,905	16	49,045	1.15 *
Beeds	130	30,462	76	14,203	0.83
Cornelia	380	25,561	17	5,937	1.44
Totals and/or Averages	10,828	1,326,397	41	195,758	2.42

* Bullheads made up more than 75 per-cent of the catch.

Similar comparisons can be made when we consider pounds per acre removed and the fish per hour catch rate. The average number of pounds of fish caught per acre was 41, ranging from five pounds per acre at Ingham Lake to 177 pounds per acre from Lost Island Lake (Table 1.). The average fisherman caught 2.42 fish per hour but the catch rate varied from 0.60 fish per hour at Ingham Lake to 6.76 fish per hour at Storm Lake.

The expanded total of 546,000 hours of fishing on these nine lakes is estimated as representing about 2.5 per-cent of the total hours of fishing in Iowa waters.

The salient features of the catch will be discussed under separate headings for each lake. Detailed data concerning the catch by species appears in appendix tables 1, 2, and 3.

Lost Island Lake

During 1957, about 40,000 fishermen caught nearly fifty tons of bullheads from Lost Island Lake, or about 85 pounds per acre. The expanded sample taken in 1958 indicated that about 68,000 fishermen caught three-quarters of a million bullheads at about the same rate (3.56 fish per hour) as they did the previous year. The increase in the number of fishermen and a slight increase in the quality of the fish resulted in a removal of 167 pounds of bullheads per acre. In spite of the heavy fishing pressure the growth increase from May, 1957, to September 1958 amounted to only 1.5 inches and 0.1 pound in weight (from five to three per pound).

Over half the bullheads taken in the five month period were taken during the month of June. Estimates place the catch during the first week-end in June at 50,000 to 60,000 fish, with as many as 3,000 fishermen on Sunday. One couple found that they had six barrels and two wash tubs full of remains after dressing bullheads for fishermen that week-end.

Bullheads made up 99.5 per-cent of the total catch with bluegills, crappies, walleyes, northern pike, largemouth bass, perch, carp, sheepshead, and common suckers making up the remaining 0.5 per-cent. This 0.5 per-cent of the total number of fish contributed 10 pounds per acre to the harvest and brought the total removal to 177 pounds per acre.

Ingham Lake:

In spite of extensive efforts to remove bullheads by seine during 1957, the average size did not improve enough to attract fishermen. Only about half the number of anglers fished this lake during 1958 as compared to 1957. The catch rate averaged 0.60 fish per hour for the season and reached a high of 1.83 fish per hour for the month of June. Bullheads made up 89 per-cent of the total number of fish but only 27 per-cent of the weight. Walleyes made up 10 per-cent of the number and 65 per-cent of the weight. Northern pike was the only other species taken.

High Lake:

This lake produced fishing for a few fishermen. The fishing pressure dropped to less than 200 trips per month during July, August and September. The large number of small bullheads and a receding shoreline discouraged the average fisherman.

Storm Lake:

This lake was one of the better fishing areas in northern Iowa in 1957 as far as catch rate was concerned (2.42 fish per hour during 1957). Although the lake level continued at an all time low during 1958, the rate of catch was even better (6.76). About twice as many fishing trips were estimated for 1958 but the overall fishing pressure and harvest was small, three trips and 16 pounds per acre respectively. Bullheads made up 90 per-cent of the catch and 85 per-cent of the weight. Fishing success reached a high of 11.3 fish per hour during June. Sixty per-cent of the total harvest was completed during June. Crappies were the only other species of importance in the catch.

North Twin Lake:

Fishing was considered excellent throughout the census period, improving somewhat over 1957 in all major catagories. Yellow bass made a strong bid for the "number 1" position making up 34 per-cent of the catch in 1958 as compared to 5 per-cent in 1957. Bullheads droped from 86 per-cent of the catch in 1957 to 52 per-cent in 1958. An important item in relation to fish management is that carp increased from less than one per-cent of the catch in 1957 to nearly nine per-cent of the catch in 1958 (22 per-cent of the weight). Carp made up over 50 per-cent of the 19 pounds per acre increase in harvest from 1957 to 1958. Seven other species recorded in the catch indicated little or no change in their relative importance.

Black Hawk Lake:

Census data indicates that fishing was three times as good on this lake in 1958 as compared to 1957. About the same number of anglers (25,635 in 1957 and 27,631 in 1958) caught more fish in less time than last year. Of the important species, only the walleye decreased in the catch, (from 4500 to 1600). Bullheads made up 54 per-cent of the catch in 1957, only 36 percent in 1958, but more bullheads were caught from the lake in 1958, both in numbers and pounds. The carp catch increased slightly but the weight nearly doubled. The number of catfish in the catch increased from 5,000 in 1957 to 15,000 in 1958. The total harvest of all species increased from 47 fish and 42 pounds per acre in 1957 to 89 fish and 60 pounds respectively in 1958.

The fishing success on Black Hawk Lake is even more remarkable in that the 0.55 fish per hour catch rate recorded in 1957 was typical of the success each year since 1952. During this six year period only the 0.75 fish per hour recorded in 1953 exceeded the 1957 figure. The reasons for this sudden increase in catch rate during 1958 are difficult to pin-point. Several factors operating at the same time would appear to be the logical answer.

The lake has been under intense management during the past ten years with primary efforts directed at rough fish removal and predator stocking. Gizzard shad have certainly effected the fisherman's success by furnishing excessive forage. Reproduction of shad as recorded by the 1958 lakes survey (based on hauls made with 500 feet of $\frac{1}{4}$" seine) was at an all time low. Possibly the most important factor operating in conjunction with those mentioned above is that the 1958 fishing season started with a lake nearly full of water following a drought ending in 1957.

Clear Lake:

Creel data were not collected on Clear Lake during 1957 and prior to this time only 45 to 60 days were censused each year. Clear Lake is a difficult lake to census from shore on a comprehensive basis, thus the data may not be as accurate as from some of the smaller lakes and those lakes receiving more census time; however, there is basis for stating that the errors probably do not exceed those expected in this type of census. Simultaneous counts of the boats and shore fisherman were made by the regular clerk from predetermined points of observation on shore and by another operator from a boat on the lake. Shore counts indicated 28 boats and 27 shore fishermen while the boat operator counted 27 boats and 29 shore fishermen. Counts made under varying conditions would likely change this correlation but additional comparisons were not made.

Bullheads supported the bulk of the fishing on Clear Lake during the census period, making up 76 per-cent of the total number of fish caught and 70 per-cent of the weight. Yellow bass, a popular fish in this lake, were small and not acceptable to anglers. This species comprised about 16 per-cent of the total catch of 178,000 fish but made up only 10 per-cent of the weight. Apposed to the figures on yellow bass, the walleyes made up only two per-cent of the catch but nearly 14 per-cent of the weight. Small numbers of bluegill, crappie, white bass, northern pike, largemouth bass, yellow perch, channel catfish, and carp made up the remaining six per-cent of the fish caught.

The catch rate of 1.15 fish per hour is almost identical to census figures for this lake in prior years. The success has not varied over 0.2 fish per hour since 1949, except during 1951 when the rate of catch jumped to 1.41 fish per hour.

Lake Cornelia:

Creel census of this lake was carried on for the first time in 1958, thus there are no comparisons to be made. This is a small (380 acres) dredged (80 acres) lake that has not received the attention it deserves due to its location and potential. In view of the possibility of pumping water into the lake and other management in the future, it seemed desirable to know something about the success of the average fisherman using the lake.

Bullheads and bluegills carried the bulk of the fishing during the census period making up 64 and 28 per-cent of the total number of fish. The lake was not heavily fished during the census period, apparently because of the relatively small size of the fish. The rate of catch was fairly high, 1.44 fish per hour for the season, and consistent throughout the five months. The predator population of walleye, northern pike, and largemouth bass contributed only two per-cent of the number of fish but 18 per-cent of the weight. Crappies and perch made up the remainder of the catch. A 17 pound per acre harvest is rather light for a small lake and may be slightly low due to a few good fishermen making exceptional catches of larger fish. One fisherman informed the census clerk that he had taken over 100 largemouth bass. This represented 25 per-cent of the total bass taken. Statistically the importance of one individuals catch is more important on a small lake than on the larger lakes. Increased growth rates among the pan fish would be of considerable value to the fishing on this lake.

Beeds Lake:

This small, 130 acre, artificial lake receives considerable fishing pressure. During the five month census period in 1958 it had a fishing pressure of 282 hours per acre, three times that recorded for West Okoboji Lake in nine months of fishing.

Crappies, among the 13 species recorded during the census, furnished the bulk of the fishing, accounting for 51 per-cent of the total number of fish caught and 49 per-cent of the total weight. The crappie harvest was about equally distributed between white and black crappies. Although not a normally important species in most artificial lakes, the bullhead catch amounted to 23 per-cent of the total, and even more surprising was the fact that the best fishing for this species occurred in August. Bluegills made up 17 per-cent of the catch followed by yellow bass at 5 per-cent. Walleye, northern pike, largemouth bass, channel catfish, yellow perch, and carp each made up less than 2 per-cent of the catch. The heavy fishing pressure resulted in a removal of 76 pounds per acre, the second highest harvest among the nine lakes censused (Table 1).

Appendix Table 1:

Number and weight of each species of fish caught by anglers fishing Lost Island, Ingham and High Lakes during the period of May through September 1958.

Species	Lost Island		Ingham		High	
	Number	Weight	Number	Weight	Number	Weight
Bluegills	137	68				
Crappie	690	320			18	9
Walleye	472	1,360	609	1,381		
N. Pike	33	49	53	161		
Bullhead	751,644	211,454	5,248	579	7,120	3,091
L. M. Bass	52	143				
Carp	2,011	8,834				
Sheepshead	636	545				
Perch	108	45				
Sucker	15	30				
Total Fish and Weight	755,798	222,838	5,910	2,121	7,138	3,100
Number of Anglers	67,799		2,611		3,645	
Total Hours of Fishing	211,710		4,770		9,842	
Average Number of Fish per Man	11.13		3.64		1.35	
Average number of Fish Caught per Hour	3.56		1.49		0.60	

Appendix Table 2:

Number and Weight of each Species of Fish Caught by Anglers Fishing Storm, North Twin and Black Hawk Lakes during The Period of May Through September 1958.

Species	Storm		North Twin		Black Hawk	
	Number	Weight	Number	Weight	Number	Weight
Bluegill	14	2	99	48	3,718	1,146
Crappie	18,355	6,223	513	242	17,733	7,322
Walleye	83	15	1,253	1,287	1,693	1,882
N. Pike			26	95		
Bullhead	169,383	42,266	28,807	15,158	30,644	10,787
L. M. Bass					521	268
Carp	158	523	4,732	6,669	13,423	15,483
Perch	17	4	85	21	1,223	856
Channel Cat	30	35	29	130	15,005	18,568
Yellow Bass			19,748	7,087	1,355	864
White Bass					107	161
L. M. Buffalo	23	216				
Total Fish and Weight	188,063	49,284	55,292	30,737	85,422	57,337
Number of Anglers	11,733		15,150		25,635	
Total Hours of Fishing	27,803		31,801		52,285	
Ave. Number of Fish per Man	16.02		3.61		3.33	
Ave. Number of Fish Caught per hour	6.76		1.74		1.63	

Appendix Table 3:

Number and Weight of Each Species of Fish Caught by Anglers Fishing Clear, Beeds, and Cornelia Lakes During the Period of May through September, 1958.

Species	Clear		Beeds		Cornelia	
	Number	Weight	Number	Weight	Number	Weight
Bluegill	4,212	1,019	5,164	1,097	6,516	1,374
Crappie	3,513	1,115	15,642	4,788	681	163
Walleye	3,381	7,700	130	81	71	230
N. Pike	44	152	13	76	41	85
Bullhead	136,312	41,084	7,138	2,139	15,214	3,718
L. M. Bass	78	258	164	232	413	875
Perch	2,125	438	514	133	625	121
Channel Cat	308	438	103	85		
Yellow Bass	27,807	5,762	1,515	475		
White Bass	876	755				
Carp	249	219	79	707		
Total Fish and Weight	178,905	58,940	30,462	9,813	23,561	6,566
Number of Anglers	49,045		14,203		5,937	
Total Hours of Fishing	155,666		36,709		16,363	
Ave. Number of Fish per Man	3.65		2.14		3.96	
Ave. Number of Fish Caught per Hour	1.15		0.83		1.44	

A Preliminary Report on The Increased Growth of Bluegills in a Southern Iowa Artificial Lake Following Reduction in the Population Density

by
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The stunting of fish due to overcrowding has confronted many fisheries workers. Within an overabundant population of fish, interspecific competition becomes of such magnitude that growth and physical condition are far below normal. The failure to attain normal growth due to population pressures ultimately results in poor angling and a quality of fish unsatisfactory to the angler.

Various techniques have been employed to renovate over-abundant population densities. Most of these techniques are designed to manipulate the population in order to reduce interspecific competition. The purpose of this study is to study the population characteristics in a typical stunted bluegill population and to determine the method and magnitude of population manipulation to improve the quality of fish for angling.

Description of Study Area:

Williamson Pond is a 27 acre, state-owned, artificial lake located two miles east of Williamson in Lucas County, Iowa. The lake was constructed in 1910 by the Rock Island Railroad Company for commerical water supply. It was purchased by the State Conservation Commission for a recreational area and completed as such in 1952.

The lake is located in an elongated, deep basined valley which divides into two arms at the upper portion of the basin. Maximum water depth is approximately 24 feet. Thermal and chemical stratification are present from May through September each year. The upper limits of the thermocline is normally located from eight to sixteen feel below the surface. The water is relatively free from inorganic turbidity. Aquatic vegetation forms a "band" of cover around the entire shoreline out to a depth of four feet. The watershed is completely covered with mature oak-hickory woodland.

In 1953 the lake was partially drained and chemically treated to eradicate the entire fish population. Unfortunately there are no records of the original species stocked in the lake. However, largemouth bass, crappie, bluegill, carp, bigmouth buffalo, channel catfish, common sucker, bullhead, green sunfish, and warmouth were found at this time. Restocking was confined to largemouth bass, bluegill, and channel catfish. Northern pike were introduced the second year of reimpoundment, but there is nn record of one being captured. The 1956 annual fisheries survey indicated that bluegills were becoming overcrowded and stunted. Fishing has been poor for the past two years.

Population Estimates and Manipulation:

Estimates of the adult portion of the bluegill population were made in 1957 and 1958. The estimates were necessary to determine population size before and after the population was manipulated. Both estimates were made by employing the Peterson mark and recovery formula:

$$P = \frac{AB}{C}$$

where

P= Population
A= Number of fish sampled
B= Number of fish marked
C= Total number of marked fish in the sample.

"A" is considered a random sample of the population after a time interval to allow

intermingling of marked and unmarked fish, and "C" is the portion exhibiting a distinquishing mark of previous capture. Sampling error involved in estimating the population was determined by using the 95 per-cent confidence or fiducial limits of the recaptured number.

In 1957, a total of 1,084 adult bluegills were marked by removing the left pelvic fin. These fish were returned to the water and allowed to intermingle with unmarked fish for approximately 45 days. During four sampling periods in the next four months, 8,864 bluegills were taken. A total of 164 marked fish were recaptured (Table 1.). Substituting these figures for the values in the Petersen formula, the population was calculated at 58,594 fish with confidence intervals of 49,782 to 69,627.

Table 1: Sample size, number of recaptured bluegills, and population estimate of adult bluegills in Williamson Pond, 1957.

Date	Sample Size (A)	No. Marked Fish Captured (C)	Ratio C/A
June 18,	4,336	72	.016
July 15,	1,508	20	.013
August 19,	1,396	40	.028
September 3,	1,624	32	.018
Total	8,864	164	

Total No. Marked --- 1,084

Total Population ----- $\frac{8,864 \times 1,084}{164}$ ----- 58,594

After determination of the approximate size of the bluegill population an attempt was made to drastically reduce the population by trapping. This was not successful because of poor nettingconditions, and only 1,700 fish were removed. As an alternate plan the water volume was reduced by 20 per-cent in order to increase predation on the bluegill. At the same time 9,600 marked fingerling largemouth bass were stocked in the impoundment to relieve interior population pressure from the younger bluegill.

An estimate of the population was made again in 1958 to determine the results of the drawdown the previous year. A total of 1,000 bluegills were marked by removing the right pectoral fin. Chemical treatment of two shallow bays produced a sample of 10,942 fish of which 319 were recaptures. The estimated population was computed at 34,306 bluegills with confidence intervals of 30,736 to 38,125. A reduction of this magnitude due to drawdown can be considered in theory only. However, the ratio of marked to unmarked fish (C/A) remained relatively constant throughout the sample period both years indicating a small error in sampling and adequate mixing of the fish. A fish kill of apparently insignificant magnitude occurred in the spring of 1958 prior to the second estimate. This may have contributed more to the population reduction than realized by casual observation.

Between 1957 and 1958 the bluegill population was reduced by approximately 48 per-cent. Chemical treatment in 1958 further reduced the population by 32 per-cent. Over the two year intensive management period the original population at the latter part of 1958 being estimated as 24,293 fish.

Perhaps a clearer picture of the reduction over the two years can be gained by using the weight of the population. Using the average weight of fish sampled in 1957, the total weight was estimated at 7,324 pounds or 271 pounds per acre. Chemical eradication and drawdown reduced this by approximately 4,330 pounds. At the end of 1958, four months after the second reduction the total population weight

was computed at 5,841 pounds of 217 pounds per acre. Recruitment of weight into the population will probably continue in 1959.

Changes in Growth and Physical Condition following Reduction of the Population Density:

Although a relatively short period of time has passed since reduction of the bluegill population, definite changes in growth and physical condition have occurred. Scale samples were obtained from 368 fish of the same year class before and after intensive management. Magnification of the scale image was used to assess the age of individual samples, and each annualus marked on a oak tagboard strip. Total length at the end of each year of life was calculated by using a straight line nomograph with an intercept on the abissca of 0.7 inches. Annual growth increments and coefficient of conditions were computed for each sampling year individually.

Fish collected in 1957 were all offspring from the original stock or three years old. Samples taken the following summer were from the same year class and were four years old. Prior to the manipulation of the population average total length for the first three years of life was 2.8, 4.2 and 5.1 inches. After reduction in 1958 mean total length for the first through fourth year of life was 3.0, 4.2, 5.0 and 6.8 inches respectively. Growth occurring before the third year of life in both samples was the growth attained before reduction of the population density, and does not display significant deviation. However, the growth pattern changed quite rapidly in the 1958 samples. Average growth increments for the year 1957 in both groups was 0.8 inches. In four months after the chemical treament in 1958 the mean growth increment increased to 1.8 inches (Figure 1). Normally, annual bluegill growth increases the first two years of life and decreases thereafter. In this case the greatest increment occurred in the fourth year of life, immediately following the thinning of the population by chemical treatment.

Coeffecient of condition or K, is used to express the physical well-being of fishes. Reciprocals of the total length were used in this study to detect any change in mean K over the two years. Mean K of 154 bluegills was 3.20 prior to the reduction. Following reduction this value change to 4.23, indicating that the fish were in much better condition.

Summary

Williamson Pond was used to determine the effects of population manipulation on growth and physical condition of adult bluegills. Prior to the reduction of population density the adult bluegill population was estimated at 58,594 fish. Efforts to reduce the population by trapping failed in 1957 because of poor netting conditions. As an alternate plan the water volume was reduced by 20 per-cent to increase predation. In 1958 the population estimate has been reduced by 48 per-cent. Chemical treatment of two shallow bays further reduced this population by 32 per-cent. Total reduction over the two years was approximately 60 per-cent.

Growth was calculated by the scale method before and after intensive management. Fish of the same year class increased in total length 1.8 inches within four months after the chemical treatment. Coeffecient of condition also increased appreciably during the same period.

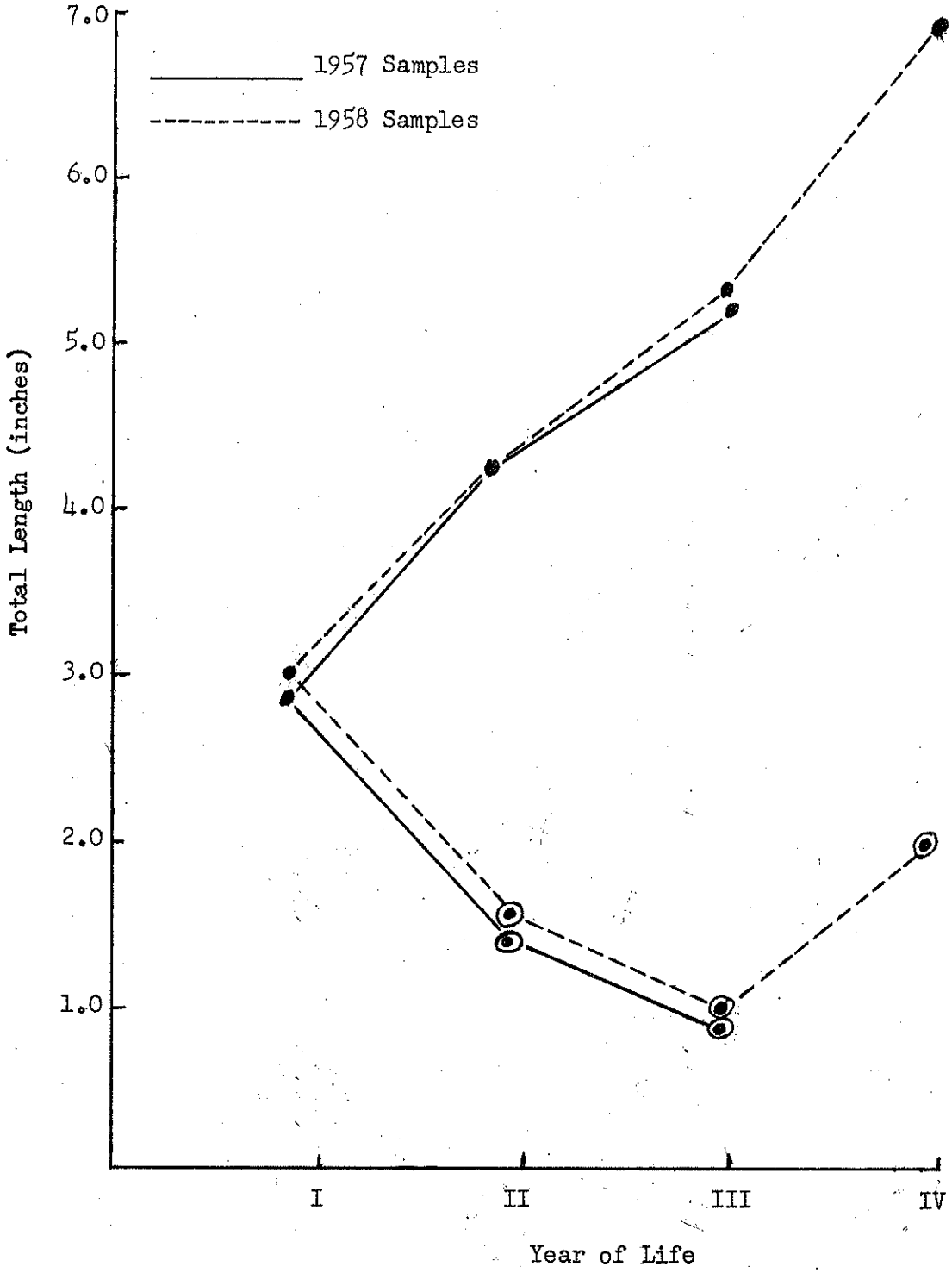

Figure 1. Average total length and annual growth increment during each year of life for bluegill in Williamson Pond. Solid line represents samples in 1957, broken line, samples taken in 1958. Single dot represents total length and encircled dots represent increments.

Results of The 1958 Iowa Deer Season

by
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INTRODUCTION:

The sixth consecutive Iowa deer season was state-wide in scope, and was of the hunter's choice-type with any deer, either sex legal. Bow hunting was permitted from November 1, to Novermber 30th inclusive, with the two-day shotgun season following on December 13, and 14th. A bag limit, possession limit, and season limit of one deer was allowed.

A total of 6,000 shotgun licenses, and 1,380 bow licenses were issued for the 1958 deer season. As in the past, shotgun deer permits were sold to the first 5,000 applicants on a first-come, first-served basis, with the remaining 1,000 licenses issued to applicants on the basis of a drawing. No limit is presently placed on the number of bow permits which may be issued.

At the present time, regulation permits landowners, tenants, and their children to hunt, kill, and possess one deer taken on their own land without a license. To legally remove the deer from the property, however, it must be tagged by the local Conservation Officer.

Methods of Securing Kill Data and Other Information:

Three sources were utilized to secure kill data, and other information pertinent to the hunting season: hunter card returns (shotgun and bow); tagged, farm-killed deer reports; and untagged, farm-killed deer reports.

Hunter Card Returns:

Each person receiving a deer permit is required to submit a report of his hunting activity and success. Post cards with questions pertaining to the deer season are furnished with each permit; a reminder is sent to each hunter who fails to return his card after a reasonable length of time.

Figure 1: Is a Facsimile of the Post Card Which Each Hunter is Asked to Complete and Return to the Conservation Commission.

1958 DEER HUNT REPORT — SHOTGUN ONLY

This hunt report card must be filled out and mailed not later than three (3) days after the close of the hunt, whether a deer is killed or not. Licensees failing to return hunt report cards may be refused special deer licenses for subsequent open hunting seasons. If you did not use the permit, indicate that you did not hunt.

Where hunted: County or counties----------
Number of hours you hunted during the season(Hours ----------
Deer killed ___ Sex (male or female)----------Age (fawn or adult)-----
Date killed---------- Time of day killed a.m. or p.m.----------
Where killed (county)----------Number of deer seen while hunting-------
Name of hunter ---------- Home county----------
Occupation----------
Address----------

Figure 1: Facsimile of the deer hunter report card used to gather information concerning areas hunted, success, hours hunted, occupation, etc.

Commission personnel sort and code the card returns, after which the cards are turned over to a data processing service for tabulation.

Tagged, Farm-killed Deer Report:

Each Conservation Officer reports the number of tags he issued to landowners or tenants wishing to transport deer off of their property for processing, storage, etc.

Untagged, Farm-killed Deer Report:

The number of deer which were killed by landowners and tenants, but not tagged for transportation from the premises, is estimated and reported by each Conservation Officer for each county in his territory.

Results:

Hunter Report Card:

Shotgun Hunter Card Returns:

A total of 5,816 hunter report cards were received out of the 6,000 issued, for a total return of 96.9 percent. Of this number, 246 reported they did not hunt, or the cards were unusable for other reasons; therefore, of the 5,816 returns, only 5,570 actually participated in the hunt.

These 5,570 hunters reported harvesting 2,141 deer, and had a hunter success ratio of 38.4 per-cent. A summary of the 1958 shotgun kill, by county, is given in Table 1.

Bow Hunter Card Returns:

A total of 1,380 bow permits were issued for the recent deer season, and 1,357 hunters returned their hunter report cards for a 98.3 per-cent return. Of the 1,357 card returns, 55 reported they did not hunt, or their returns were otherwise unusable.

The 1,302 bow hunters who used their permits harvested a total of 162 deer, for a hunter success ratio of 12.4 per-cent. A summary of the 1958 bow kill is included in Table 1.

Conservation Officer Reports:

Tagged, and Untagged, Farm-killed Deer:

Conservation Officers reported tagging 187 farm-killed deer for transportation from the land on which they were taken. The Officers further estimated that an additional 401 deer were killed on farms, but were not taken from the farms and, therefore, were not tagged.

Table 1, shows the farm-killed deer which were reported for each county by the local Conservation Officer.

Total Deer Kill:

The total deer kill during the 1958 deer season was 2,891 animals. This figure was obtained by summing all of the available kill information: shotgun hunter card returns; bow hunter card returns; tagged, farm-killed deer reports;

and untagged, farm-killed deer reports.

Despite the extremely cold weather experienced during the shotgun portion of the hunting season, the total deer kill was only slightly below the mean for the proceeding five years of record. Table 2 lists the total annual deer kill for the State from 1953, the first Iowa deer season in recent years to the present season.

Sex and Age Ratios of Harvested Deer:

Sex Ratio:

Shotgun hunters reported killing 1,364 male deer and 772 female deer, for a sex ration of males to females of 177:100. Bow hunters took 114 males and 48 females which gave a male to female sex ratio of 237:100.

From the differences noted in the sex ratios of the harvested deer, as reported by the two different groups of hunters, it is evident that the bow hunter exercises much greater selectivity than does the shotgun hunter when shooting an animal.

Age Ratios (Young to Adults):

Shotgun hunter returns indicated that 448 fawns and 1,682 adults were killed by them. The ratio of young to adults, according to these data, was 26.6:100.

Bow hunters harvested 28 fawns, and 134 adults for a young to adult ratio of 20.9:100.

Sex and age ratios, as reported from shotgun hunter report cards, differed greatly from those derived from check station and locker plant data which were gathered by experienced Conservation Commission personnel during and immediately after the recent shotgun season.

Kline (1958), reporting on these data, indicated a male to female sex ratio, based on a sample of 510 deer, of 112:100. When only the sex ratio of the fawns was considered, in a sample of 231 fawns, the male to female ratio was 116:100.

Kline further reported a fawn to adult (young to adult) ratio of 82.8:100 which differs tremendously from the 26.6:100 reported by the shotgun hunters.

Numer of Deer Observed While Hunting:

Hunters were asked to indicate on their report card the number of deer they observed while hunting. The number reported, however, does not mean that Iowa's deer herd is that large, for undoubtedly an individual deer could have been seen and reported by more than one hunter. The mean number of deer seen per hunter could, however, perhaps serve as a crude measure of deer population trend for a given county when the means for a period of years are observed.

Shotgun hunters reported seeing 41,347 deer while hunting, for an average of 7.42 animals sighted per hunter. The average shotgun hunter saw 0.64 deer per hour hunted during the 1958 season.

Bow hunters reported sighting 19,855 deer while engaged in their sport, for an average of 15.2 seen per hunter during the course of the season. While the average bow hunter saw more deer during the season than the average shotgun hunter, he saw only about half as many on a per-hour hunted basis; the average bow hunter saw 0.34 deer per hour while he hunted.

Day Killed and Time of Day:

Shotgun:

A total of 2,115 card returns contained data pertaining to the day and time of day which deer were killed by gun hunters.

They reportedly took 932 animals the first day of the season, and 1,123 the second day. According to these data, approximately 47 per-cent of the deer killed were taken the first day, and the remaining 53 per-cent the second day of the open season.

Time of day, that is, morning vs. afternoon, seemed to have little influence, for about 50 per-cent of the total gun kill was taken during each of these periods.

Bow:

All bow hunters who shot a deer reported on both the date and the time of day the kill was made.

Box hunters took 70 of the 162 total kill during the first 15 days of the 30-day season, or 43 per-cent of the bow-killed deer were taken during the first half of the open season, with the remaining 57 percent taken during the last half of the season.

Time of day seemed to matter very little, with about 50 per-cent of the deer being killed in the morning, and the other 50 per-cent in the afternoon.

Hunter Mobility:

The average hunter did not confine his hunting efforts to one county according to data taken from the hunter return cards. The average shotgun hunter hunted in 1.16 counties, while the average bow hunter ranged in 1.48 counties.

The greater mobility of the bow hunters undoubtedly reflects the longer length of the bow season which allowed greater opportunity to hunt in more areas than could the average gun hunter during his short two-day season.

Hunter Occupation:

Shotgun Hunter Occupations:

The number and percentage of the total hunters occurring in each occupational category, as well as the number of deer harvested and the hunter success ratio of each group, is indicated in Table 3. Numerically, laborers and farmers were just about the same, with the labor group only slightly larger. However, those classified as farmers harvested more deer, and had a higher hunter success ratio than any other group.

Bow Hunter Occupations:

Table 4 indicates the occupations and hunter success ratios of the various occupational groups of bow hunters who participated in the 1958 deer season.

Hours of Recreation and Hours Hunted Per Deer Bagged:

Iowa's licensed deer hunters, both bow and shotgun, spent a grand total of 123,514 hours, or 15,439 eight-hour days, in pursuit of their game.

The 5,570 shotgun hunters hunted a total of 64,723 hours, for an average of 12 hours spent hunting for each gun hunter. One deer was taken for each 30.2 hours of effort expended by the shotgunners.

Bow Hunters reported hunting a total of 58,791 hours during the 1958 deer season, for an average of 45.1 hours of hunting per bowman. An average of 363 hours of hunting was required of the bow hunters for every deer reduced to possession.

SUMMARY:

1. Iowa's sixth consecutive deer season was of the hunter's choice-type, with one deer, either sex being legal. The season was state-wide in scope, with all 99 counties open to both shotgun and bow hunting.
2. Deer permits were issued to 6,000 shotgun hunters, and 1,380 bow hunters.
3. Hunter card returns were received from 5,816 gun hunters, and 1,357 bow hunters, for a 96.9 per-cent and a 98.3 per-cent return respectively.
4. Data from card returns and Conservation Officer reports concerning farm-killed deer, indicate a total harvest of 2,891 deer during the recent season.
5. The 5,570 shotgun hunters who reportedly hunted deer took 2,141 animals and had a hunter success ratio of 38.4 per-cent.
6. The 1,302 bow hunters who hunted harvested 162 deer, for a hunter success ratio of 12.4 per-cent.
7. Conservation Officers reported tagging 187 farm-killed deer for transportation, and estimated that an additional 401 deer were taken by unlicensed landowners and tenants during the season.
8. The shotgun hunters reported killing 1,364 males and 772 females for a sex ratio of males to females of 177:100, while bow hunters killed 114 males and 48 females for a male to female sex ratio of 237:100.
9. Shotgun hunters harvested 448 fawns and 1,682 adults for a young to adult ratio of about 27:100, while bow hunters took 28 fawns and 134 adults for a young to adult ratio of 21:100.
10. Sex and age ratios, as determined from the hunter report cards, are quite different from those determined from check station data.
11. The average shotgun hunter reported sighting 7.42 deer during the recent season, or 0.64 deer per hour hunted; while the average bow hunter saw 15.2 deer during the bow season, or 0.34 deer seen per hour hunted.
12. Shotgun hunters shot 47 per-cent of their deer the first day and 53 per-cent the second day. Bow hunters took 43 per-cent of their deer during the first 15 days of the season and 57 per-cent during the last 15 days of the 30-day bow season.
13. Time of day morning vs. afternoon, seemed to have little effect on the number of deer killed, with both shotgun and bow hunters reporting that about 50 per-cent of their kills were made in each period.
14. The average hunter hunted in more than one county: shotgun hunters hunted in 1.16 counties, with bow hunters reportedly hunting in 1.48 counties.
15. Iowa's licensed hunters spent 123,514 hours, or 15,439 eight-hour days, indulging in their sport, with shotgun hunters and bow hunters reporting 64,723 and 58,791 hours respectively.
16. Laborers comprised 34.7 per-cent of the licensed gun hunters, with farmers making up 34.2 per-cent of all gun hunters. Over 47 per-cent of the bow hunters were laborers, with farmers, the next largest occupational group, comprising 12.3 per-cent.
17. Shotgun hunters spent an average of 30.2 hours hunting time for every deer they took, and bow hunters spent 363 hours for every deer bagged.

LITERATURE CITED

Kline, Paul D. 1958: A report of the 1958 deer season based on data from checking stations. Ia. Cons. Comm., Quart. Biol. Rpt. 10(4):19-26.

Table 1: Shotgun, Bow, and Farm-killed Deer, by County, and the Number of Licensed Hunters Who Reported Hunting in Each County, Iowa, 1958.

County	Shotgun		Bow & Arrow		Farm-Killed Deer	Total Deer
	Deer Killed	No. Hunters	Deer Killed	No. Hunters		
Adair	9	28	0	6	0	9
Adams	5	19	1	14	2	8
Allamakee	276	862	3	35	16	295
Appanoose	0	8	0	1	6	6
Audubon	4	9	0	1	7	11
Benton	18	88	4	18	0	22
Black Hawk	35	90	4	83	11	50
Boone	8	43	0	23	1	9
Bremer	29	93	1	26	9	39
Buchanan	12	54	2	20	2	16
Buena Vista	30	67	2	16	5	37
Butler	23	72	0	21	6	29
Calhoun	1	3	0	1	1	2
Carroll	5	11	0	2	6	11
Cass	2	16	2	12	4	8
Cedar	7	40	0	4	1	8
Cerro Gordo	5	10	0	12	0	5
Cherokee	35	100	2	29	6	43
Chickasaw	33	100	2	16	10	45
Clarke	11	29	0	1	1	12
Clay	42	123	1	33	6	49
Clayton	103	330	4	39	38	145
Clinton	17	72	3	53	0	20
Crawford	12	29	0	3	26	38
Dallas	13	70	1	16	1	15
Davis	0	3	0	2	0	0
Decatur	18	75	2	8	1	21
Delaware	26	102	10	51	2	38
Des Moines	12	42	3	27	0	15
Dickinson	9	11	2	9	10	21
Dubuque	12	82	0	12	3	15
Emmet	11	32	3	27	9	23
Fayette	44	113	0	9	11	55
Floyd	12	50	2	29	2	16
Franklin	6	16	0	5	3	9
Fremont	17	26	0	17	0	17
Greene	5	32	0	7	2	7
Grundy	0	1	0	1	0	0
Guthrie	20	73	1	26	6	27
Hamilton	14	46	1	24	2	17
Hancock	5	28	0	9	0	5
Hardin	22	78	4	25	1	27
Harrison	44	69	1	11	9	54
Henry	4	26	3	13	1	8
Howard	16	40	2	16	6	24
Humboldt	16	53	1	12	3	20
Ida	0	2	0	0	1	1
Iowa	38	127	0	23	4	42

Table 1: Continued

County	Shotgun Deer Killed	Shotgun No. Hunters	Bow & Arrow Deer Killed	Bow & Arrow No. Hunters	Farm-Killed Deer	Total Deer
Jackson	84	197	4	56	20	108
Jasper	22	65	3	25	2	27
Jefferson	7	15	0	4	4	11
Johnson	26	121	1	25	3	30
Jones	17	64	1	10	3	21
Keokuk	12	62	5	15	4	21
Kossuth	72	109	5	15	11	88
Lee	4	36	3	15	0	7
Linn	31	107	0	46	4	35
Louisa	9	25	2	22	1	12
Lucas	21	99	5	20	9	35
Lyon	23	68	2	13	6	31
Madison	26	89	0	8	2	28
Mahaska	6	39	0	17	1	7
Marion	17	66	1	9	6	24
Marshall	18	53	0	17	8	26
Mills	13	26	1	12	8	22
Mitchell	34	62	3	32	7	44
Monona	50	93	8	32	30	88
Monroe	17	71	1	8	14	32
Montgomery	5	13	3	17	3	11
Muscatine	9	25	1	8	0	10
O'Brien	16	52	2	22	6	24
Osceola	0	0	0	5	0	0
Page	5	7	0	14	1	6
Palo Alto	8	28	1	2	3	12
Plymouth	10	45	1	14	2	13
Pocahontas	7	27	0	0	1	8
Polk	7	48	2	75	1	10
Pottawattamie	82	160	16	101	89	187
Poweshiek	0	12	0	5	1	1
Ringgold	0	11	0	1	0	0
Sac	2	6	1	3	5	8
Scott	7	36	2	30	1	10
Shelby	59	95	5	29	11	75
Sioux	17	56	4	26	3	24
Story	6	10	0	4	0	6
Tama	25	81	0	10	13	38
Taylor	3	6	0	3	0	3
Union	9	27	0	3	0	9
VanBuren	6	16	1	10	6	13
Wapello	6	20	0	9	5	11
Warren	21	83	1	26	2	24
Washington	29	114	1	9	11	41
Wayne	1	4	0	1	0	1
Webster	12	27	2	24	9	23
Winnebago	8	42	0	18	0	8
Winneshiek	123	306	2	21	13	138
Woodbury	37	102	3	51	13	53

Table 1. Continued

County	Shotgun Deer Killed	Shotgun No. Hunters	Bow & Arrow Deer Killed	Bow & Arrow No. Hunters	Farm-Killed Deer 1/	Total Deer
Worth	12	33	1	25	5	18
Wright	0	7	0	10	0	0
Unknown	14	14	1	5	--	15
Totals	2,141	6,473	162	1,830	588	2,891

1/ Includes both tagged, and untagged farm-killed deer.

Table 2: Total Deer Kill, by Years, Iowa, 1953 to Date.

Year	Total Kill
1953	4,008
1954	2,992
1955	3,062
1956	2,678
1957	2,805
1958	2,891
Total	18,436
Mean 1/	3,109

1/ Average total kill for the five year period preceeding the recent 1958 deer season.

Table 3: Occupations and Hunter Success of the Various Occupational Groups as Reported by 5,570 Shotgun Hunters, Iowa, 1958.

Occupation	Number of Hunters	Per-cent of Total Hunters	No. Deer Harvested	Hunter Success Ratio
Laborer	1935	34.7	678	35.0
Farmer	1907	34.2	851	44.6
Merchant	442	7.9	160	36.2
Professional	191	3.6	75	39.2
Technician	178	3.2	60	33.2
Retired	65	1.2	27	41.5
Housewife	18	0.3	6	33.3
Miscellaneous	820	14.7	272	33.1
Unknown	14	0.2	12	----
Totals	5,570	100.0	2,141	
Mean Hunter Success				38.4

Table 4: Occupations and Hunter Success of the Various Occupational Groups as Reported by 1,302 Bow Hunters, Iowa, 1958.

Occupation	Number of Hunter	Per-cent of Total Hunters	No. Deer Harvested	Hunter Success Ratio
Laborer	614	47.2	73	11.9
Farmer	161	12.3	24	14.9
Merchant	119	9.2	16	13.4
Professional	69	5.3	9	13.0
Technician	57	4.4	4	7.0
Retired	3	0.2	0	0.0
Housewife	13	1.0	1	7.7
Miscellaneous	261	20.1	33	12.6
Unknown	5	0.3	2	---
Totals	1,302	100.0	162	
Mean Hunter Success				12.4

An Evaluation of The Winter Roadside Rabbit Census in Iowa

By
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Game Biologist

INTRODUCTION

Statewide surveys of cottontails in Iowa were first begun in 1950 when the February and July roadside counts, and the hunter-cooperator project were initiated. Each survey was intended to give insight into some particular phase of cottontail population dynamics and hunting success. The February (winter) roadside counts were expected to reflect pre-breeding rabbit populations (Sanderson, 1950); the July (summer) roadside counts were expected to reflect rabbit populations and breeding success within the state and, if possible, to portend fall hunting populations; and finally, the hunter-cooperator project was designed to reflect actual hunting success.

The winter and summer roadside counts were patterned somewhat like the survey used in Missouri (Wight, 1956). These counts were conducted by all conservation officers and biologists in their respective territories. Participants were instructed to select 30 to 40 miles of gravel roads which passed through their areas for use as their survey routes. Both February and July counts were made on the same routes; although under different regulations.

The winter counts were made during the last two weeks of February. Each participant was instructed to drive his route early in the morning at a rate of 20 to 30 miles per hour. Counts were to be completed before sunrise. All cottontails seen on or alongside the routes were to be recorded by the observers. The indices of cottontails observed per 10 miles of survey routes have been used to compare population levels between areas and by seasons. This report presents the data obtained from the winter surveys and the apparent influence of weather factors upon the indices obtained.

The rabbit surveys have been continued annually since 1950 - ten years for the winter roadside counts. Moderate changes in gathering of data have been incorporated. From 1955 through 1959 observers were requested to record snow cover when the counts were made. Snow was recorded by percent of ground covered and by average depth (Sanderson, 1955). In 1958 and 1959 participants were asked to record wind velocity, cloudiness, and temperature at the time counts were conducted. These refinements were added primarily to gather information relevant to the possible influence of weather upon results of the winter surveys. In 1958 and 1959, also, records were first kept of jackrabbits seen; and of location of all rabbits, i. e., whether "on" or "off" the travelled portions of the survey roads. It was believed more rabbits might be seen "off" the roads when snow covered the ground.

Results

Superficial examination of 10 years' data on a statewide basis (Table 1) indicates the cottontail population remained fairly stable from 1950 to 1953. It dropped considerably by 1954 and appears to have remained low through 1957. Increases appear for both 1958 and 1959. The highest population is indicated for 1959 when an index of 4.23 (rabbits per 10 miles) was obtained. The low index (1.16) appeared in 1954. Another very low index was obtained in 1957 (1.29).

By areas (Kline, 1958, and Figure 1) the data presents a somewhat different picture. In the southern loess of southeast and south central Iowa the cottontail population appears to have remained steady from 1950 to 1952 followed by a decline in 1953 and '54. Then the rabbits became more numerous each year until 1959 when a decline was indicated. In much of the remainder of Iowa (Tazewell drift excepted) it appears the cottontail population was moderate from 1950 through 1953; was low from 1954 to 1957; and has increased each of the past two years ('58 and '59). Considerable inconsistencies appear in the data, however, and it is difficult to draw conclusions.

The average of 10 years' indices for each of seven areas (Figure 1) indicates higher average rabbit populations have existed in the Tazewell drift than in any other portion of Iowa. This is contrary to expectation as there can be no doubt best rabbit habitat exists in portions of southern Iowa. True enough, average indices for the southern and Mississippi loess areas (having good rabbit habitat) are above the statewide, ten year average index of 2.22; but the driftless area of northeast Iowa is higher also. That area does not have much good cottontail habitat. And the Missouri loess of western Iowa has an index lower than the statewide average. These comparisons reveal further inconsistencies which make the data difficult to evaluate.

An explanation for the apparently inconsistent data appears in Table 2. In comparing indices from counts made under varying snow conditions, it was found, in most instances, that fewer cottontails were seen when the ground was not covered by snow or only partially snow covered than when it was mostly snow covered. In other words, good snow cover contributed to high indices for the February surveys. Exceptions to this rule appear in the data for 1957 when only 198.3 miles of survey were made when the ground was over 50 percent snow covered. The 198.3 miles were driven in areas having low rabbit populations.

Three descrepancies appear in the 1958 data. Indices for the Missouri loess, Wisconsin drift, and driftless areas were lower under conditions of 51 percent or more snow cover than under conditions of less snow. These cannot be easily explained. However, only one survey was made under suitable snow cover in the driftless area. During 1959 all surveys conducted in the southern loess, except one, were made when the ground was 50 percent or less snow covered. An index resulted that was not indicative of the rabbit population.

Influence of snow cover on results of the February counts are indicated most aptly in Table 3. Comparison of miles driven under good snow conditions (ground 51 percent or more covered) with statewide indices reveals a direct correlation between the two. Indices corresponded directly with percentage of miles driven under good snow conditions. Lowest index was obtained in 1957 when only 7.6 percent of the total miles of survey embraced good snow conditions. The highest index resulted in 1959 when 56.3 percent of the total miles embraced good snow conditions.

Records from the 1958 and '59 surveys reveal snow cover had a direct influence on numbers of cottontails which observers were able to see "off" the roads. More cottontails were seen "off" the roads when the ground was snow covered than when not (Table 4). Combined data from two years shows 24.7 percent of all rabbits observed were seen "off" the roads when no snow was present. In contrast, when the ground was completely snow covered, 40.8 percent of all cottontails observed were seen "off" the road.

Wind seems to have an influence on the rabbit counts as revealed in Table 5. For years 1958 and '59 fewer rabbits were seen when the wind blew harder than 8 miles per hour than when it blew eight miles per hour or less. This is consistent with the findings of Newman (1957) who learned on his experimental winter survey that fewer cottontails were observed on his routes when the wind blew 10 miles per hour or more than when less.

Cloudiness was recorded also in 1958 and 1959 (Table 6). For 1958 it seemed more cottontails were observed under clear skies than under cloudy skies. In 1959, the reverse was true. Data from the two years combined shows there probably is no correlation between cottontails observed and cloudiness.

A direct correlation appears between temperature and cottontails observed. The data for 1958 and 1959 shows more rabbits were seen when the temperature was 32 degrees F. or less than when higher (Table 7). Newman (op. cit.) found no correlation between temperature and cottontail activity. Probably the data here presented actually reflects snow conditions, i.e., temperatures probably averaged lower when the ground was snow covered. It has already been shown snow cover influences the rabbit indices.

Discussion

Validity of the February roadside counts is seriously questioned by analysis of the data presented in this paper. The writer feels the survey may actually be more indicative of snow conditions than of rabbit abundance. The influence of snow upon winter rabbit counts was first aptly demonstrated by Newman (op. cit.) who found direct correlation between snow cover and numbers of rabbits observed on his experimental routes in southern Iowa.

The writer has suspected for several years that snow had considerable effect upon this survey. Instructions to participants during recent years asked that the surveys be run when snow covered the ground. Obviously this is not always practical as the vagaries of climate do not always provide snow. The problem of obtaining valid data from this survey seems almost insurmountable. It would appear as the rabbit population may not fluctuate radically in wintertime, that time for the survey might be extended from the last two weeks of February to all of January and February in order, to facilitate making counts when snow covers the ground. However, experimental surveys by the writer in Benton County (Unpublished data) show fewer cottontails are seen late than early in winter. Possibly roadside rabbit hunting during season is here influencing.

Actually the need for the winter survey can be questioned. Wight (1959) has shown in Missouri that hunting success (which is our ultimate interest) is related to adults seen per mile during summer surveys, multiplied by average reproductive success (young per adult). Under this system the breeding population can be determined by summer roadside counts. These are run at the present time in Iowa; consequently, need for the winter pre-breeding survey is nullified.

Summary

1. Data from 10 years winter roadside surveys of rabbits is presented.

2. Fluctuations of cottontail populations in various portions of Iowa and from year to year are presented and discussed.

3. Snow cover present at the time of survey is show to be a controlling factor: The data indicates indices obtained from the surveys may reflect snow conditions and obscure changes in rabbit abundance.

4. The need for the winter roadside counts of cottontails is questioned.

Literature Cited

Kline, Paul D. 1958. Results of the July, 1958, roadside rabbit survey. Quar. Biol. Rep. 10(3): 30-35. Iowa Cons. Comm. Des Moines

Newman, Emil D. 1957. Factors influencing the winter roadside census of the cottontail rabbit in south-central Iowa. Unpub. M. S. Thesis. Iowa State Coll. Library. Ames, Iowa.

Sanderson, Glen C. 1950. Report on pre-breeding rabbit survey - 1950. Quar. Biol. Rep. 1 (2): 31-34. Iowa Cons. Comm. Des Moines

1955. Pre-breeding rabbit survey - 1955. Spec. Rep. submitted to State Cons. Comm. 1-7 pp. typewritten.

Wight, Howard 1956. Keeping tabs on rabbits. Mo. Cons. 17 (2): 1-3.

1959. Eleven years of rabbit-population data in Missouri. Jl. Wildl. Mgmt. 23 (1): 34-39.

Table 1. Results of February roadside rabbit counts for years 1950 - 1959: Cottontails seen per 10 miles of survey.

Area	Year									
	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Tazewell Drift	2.77	3.32	4.93	5.23	0.87	1.25	2.82	0.47	4.13	9.42
Missouri Loess	2.10	3.20	2.31	1.16	1.02	1.48	0.81	0.75	2.31	3.95
Wisconsin Drift	2.20	2.63	2.32	3.02	0.96	2.18	2.27	0.85	1.04	4.15
Iowan Drift	2.68	1.68	2.16	1.74	1.52	1.53	1.34	0.74	1.38	4.66
Driftless Area	3.42	2.57	1.80	2.04	0.80	1.33	1.54	0.73	1.13	7.76
Mississippi Loess	3.46	2.79	3.05	2.01	0.89	1.99	1.65	1.74	3.31	4.25
Southern Loess	1.69	2.53	2.31	1.05	1.51	2.41	2.06	2.58	4.04	3.28
Statewide	2.52	2.46	2.51	2.16	1.16	1.89	1.72	1.29	2.27	4.23

Table 2. Effect of snow cover on roadside rabbit surveys, 1955-59: Cottontails seen per 10 miles of route.

Area	Year									
	1955		1956		1957		1958		1959	
	0-50% Snow	51-100 % Snow	0-50% Snow	51-100 % Snow	0-50% Snow	51-100 % Snow	0-50% Snow	51-100 % Snow	0-50% Snow	51-100 % Snow
Tazewell Drift	----	1.25	----	2.82	0.47	---	4.13	----	----	9.42
Missouri Loess	0.83	2.01	0.81	----	0.73	0.89	2.89	1.68	3.82	4.36
Wisconsin Drift	1.18	2.92	1.04	2.84	0.96	0.43	1.05	1.00	1.73	3.98
Iowan Drift	1.31	2.03	1.29	1.43	0.77	0.28	1.18	1.60	0.77	4.67
Driftless Area	----	1.33	1.40	1.64	0.74	----	1.31	0.80	---	7.76
Mississippi Loess	1.73	4.68	1.47	3.33	1.74	----	2.93	4.02	4.13	4.66
Southern Loess	2.35	3.13	1.92	3.33	2.58	----	3.59	4.00	3.04	2.46
Statewide	1.65	2.32	1.36	2.45	1.34	0.50	2.07	2.47	3.02	4.96
Cottontails Seen (state)	263	221	227	202	325	10	287	236	301	619
Survey Miles (Statewide)	1597.1	951.0	1663.1	825.7	2419.1	198.3	1389.3	953.9	969.4	1248.6

Table 3. Comparison of snow cover and cottontail indices for years 1955-59.

	Year				
	1955	1956	1957	1958	1959
Percentage of Miles Driven When Ground 51 Percent or more Snow Covered	37.3	33.2	7.6	40.7	56.3
Statewide Index of Rabbits per 10 Miles	1.89	1.72	1.29	2.27	4.23

Table 4. Effect of snow cover on distribution of cottontails seen during 1958 and 1959 surveys.

Year	Cottontail Distribution*	Percent Snow Cover			
		Snow Absent	1-50 Percent Snow Cover	51-99 Percent Snow Cover	Complete Snow Cover
1958	Percent on Road	77.6	62.4	56.7	48.9
	Percent off Road	22.4	37.6	43.3	51.1
1959	Percent on Road	72.6	71.8	61.7	63.3
	Percent off Road	27.4	28.2	38.3	36.7
1958-59 Combined	Percent on Road	75.3	67.5	61.2	59.2
	Percent off Road	24.7	32.5	38.8	40.8

* Cottontails were designated "on" the road when they actually were seen on the travelled portion of the road.

Table 5. Effect of wind on numbers of cottontails seen during winter surveys.

Year	Wind Over Eight Miles Per Hour			Wind Eight Miles Per Hour or Less		
	Total Miles	Cottontails Seen	Cottontails per 10 Miles	Total Miles	Cottontails Seen	Cottontails per 10 Miles
1958	406.3	72	1.8	1,758.9	417	2.4
1959	133.3	32	2.4	1,612.8	776	4.8
1958-59 Combined	539.6	104	1.93	3,371.7	1,193	3.54

Table 6. Effect of cloudiness on numbers of cottontails seen during winter surveys.

Year	Complete Overcast			Partly Cloudy			Clear		
	Total Miles	Cotton-tails Seen	Cotton-tails / 10 Miles	Total Miles	Cotton-tails Seen	Cotton-tails / 10 Miles	Total Miles	Cotton-tails Seen	Cotton-tails / 10 Miles
1958	694.9	123	1.8	201.1	43	2.0	1,047.5	264	2.5
1959	252.2	131	5.2	650.1	259	4.0	703.4	248	3.5
1958-59 Combined	947.1	254	2.7	860.2	302	3.5	1,750.9	512	2.9

Table 7. Effect of temperature on numbers of cottontails seen during winter surveys.

Year	Temperature Over 32 Degrees F.			Temperature 32 Degrees F. or Less		
	Total Miles	Cottontails Seen	Cottontails per 10 Miles	Total Miles	Cottontails Seen	Cottontails per 10 Miles
1958	523.2	104	2.0	1,425.7	370	2.7
1959	169.0	65	3.85	1,735.5	707	4.1
1958-59 Combined	692.2	169	2.44	3,161.2	1,077	3.47

Waterfowl Bag Checks- 1958

James G. Sieh
Game Biologist

The State Conservation Commission requested conservation officers and other field personnel to make waterfowl bag checks and complete tally cards during the 1958 open season. This was the eleventh consecutive year this program was undertaken to sample waterfowl harvested in Iowa. Commission personnel reported checking 6,444 waterfowl hunters in 50 counties who had hunted 24,292 hours (Appendix Tables 1 and 2). These nimrods harvested 6,699 ducks and 680 geese. These figures provide a small sample of the kill and the date obtained were comparable with similar information collected from 1948 through 1957.

Sixteen species of ducks, mergansers, and four species of geese were taken by wildfowlers. The Iowa hunter bagged one duck in 3.5 hours of hunting in 1958 indicating a slightly poorer than average duck-per-hour kill figure (Table 1). Goose hunting was above average requiring 34.5 hunting hours afield to average one goose in the bag. Unsuccessful hunters averaged 2.9 hours in the field when checked in 1958.

Table 1. (1948 - 1958)

YEAR	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Av. Hunt. Hours Per Duck Killed	2.3	3.1	4.1	1.9	3.2	3.2	3.6	3.2	2.1	2.9	3.5
Av. Hunt. Hours Per Goose Killed	67.6	25.4	41.1	52.0	183.7	27.1	81.7	114.8	30.2	42.2	34.5
Av. Hunt. Hours Per Unsuc'ful Hunter	2.2	2.8	3.3	2.1	2.4	2.8	2.8	2.7	2.2	2.7	2.9

Mallards totaled 59.9 percent of the ducks examined and this sample comprised 3,981 birds in the bag in 1958. This species has averaged approximately 50 percent of the total duck harvest in Iowa since 1948.

The Blue-winged teal harvest dropped to 14.2 percent and the Green-winged teal harvest increased to 13.2 percent of aggregate kill in 1958. Pintails accounted for 3.9 percent, and lesser scaup only 2.9 percent of this sample.

The season on wood ducks was again closed in 1958, but field personnel were requested to record all known dead wood ducks. Thirty-eight, or 0.6 percent were tallied during the 1958 closed season compared with 1.1 percent tallied in 1957 and 3.1 percent in 1956. These figures do not adequately represent all wood ducks discarded by hunters; However, they provide an indication of the kill during a closed season.

During the past decade there has been little change in the harvest of the remaining ten species of ducks and mergansers sampled. The Black Duck, Gadwall, Baldpate, Shoveller, Redhead, Ringnecked duck, canvasback, Goldeneye, Bufflehead, Ruddy Duck and Mergansers have comprised a very small fraction of the annual waterfowl harvest. In aggregate, these ten species have never exceeded 12 percent of the total, nor has an individual species exceeded 3 percent.

Snow geese contributed 36.8 percent of all geese sampled in 1958. Blue geese contributed 31.6 percent, while Canada geese and their subspecies totaled 28.1 percent. Eight white-fronted geese were reported in 1958; However, only a few White-fronts have been reported during seven of the eleven years on record.

APPENDIX
Table 2.

1958 COMBINED TOTALS AND PERCENTAGES

	TOTAL RECORDED KILL BY SPECIES								
	1950	1951	1952	1953	1954	1955	1956	1957	1958
Hunters Seen									
Bags Not Checked	2,807	6,800	2,163	4,222	3,266	3,678	1,498	1,998	1,055
Size of Hunting Party 1.	572	1,198	969	993	899	830	751	933	720
(man) 2.	979	1,907	1,367	1,464	1,556	1,264	1,253	1,517	1,264
(man) 3.	434	800	551	1,644	631	577	542	717	593
(man) 4.	192	362	232	266	312	228	223	314	212
Five or more than 5.	91	207	93	133	121	121	136	179	92
Total Number of Hunters	5,170	9,955	6,838	7,839	7,887	6,776	6,567	8,516	6,444
Total Hours Hunted	19,132	25,419	20,141	27,484	26,472	22,523	15,513	29,856	24,292
None Taken									
Number of Hunters	1,921	2,368	2,557	2,474	2,848	2,333	1,889	2,542	2,173
Hours Hunted	6,340	5,029	6,184	7,000	8,012	6,431	4,167	6,888	6,387
Mallard	2,344	7,354	2,698	4,121	3,916	3,673	2,998	5,139	3,981
Black Duck	71	168	54	27	37	19	24	42	15
Gadwall	98	207	56	80	62	92	76	58	105
Baldpate	50	231	71	59	97	83	88	132	106
Pintail	291	1,252	634	477	382	345	337	536	263
G. W. Teal	399	885	697	523	860	656	717	511	872
B. W. Teal	637	1,502	810	2,013	736	966	2,736	3,185	952
Shoveller	91	244	110	118	94	62	56	85	76
Wood Duck*	148	464	427	321	7	217	81	33	38
Redhead	62	264	71	60	76	157	68	67	9
Ring-necked	26	138	35	68	90	37	33	42	31
Canvas-back	43	229	77	72	104	74	36	58	25
Lesser Scaup	351	787	468	557	649	459	175	364	196
Golden-eye	9	36	8	8	13	10	3	10	6
Bufflehead	9	10	9	19	5	17	4	12	3
Ruddy Duck	19	70	45	34	58	49	14	10	12
Merganser	18	29	19	19	14	15	6	8	10
TOTAL DUCKS	4,666	13,870	6,289	8,594	7,200	6,931	7,452	10,292	6,699
Canada Geese	73	127	54	297	66	95	136	106	191
Blue Geese	181	214	21	309	115	39	171	308	215
Snow Geese	180	128	32	353	139	53	197	282	250
White Fronted Geese	7			6	3	4		4	8
Other Geese			2	48	1	5	8	7	16
TOTAL GEESE	441	469	109	1,013	324	196	512	707	680
Coots	63	344	185	42	282	229	130	82	99
Parties With Dogs	240	601	316	437	246	266	205	221	198
Unretrieved Ducks & Geese	45	187	69	62	46	58	57	64	50
Parties With Dogs	2,028	3,873	2,896	3,064	3,273	2,754	2,700	3,439	2,682
Unretrieved Ducks & Geese	508	1,680	658	779	548	465	557	901	703
TOTAL PARTIES CHECKED	2,268	4,474	3,212	3,501	3,519	3,020	2,905	3,660	2,880

*There was a closed season on wood duck in 1956, 1957, and 1958, but the figures indicate known dead wood ducks.

APPENDIX
Table 2.
(Continued)

1958 COMBINED TOTALS AND PERCENTAGES

	TOTAL RECORDED KILL BY SPECIES								
Species	1950	1951	1952	1953	1954	1955	1956	1957	1958
Mallard	50.2%	53.0	42.9	47.9	54.4	53.0	40.2	49.9	59.4
Black Duck	1.5	1.2	0.9	0.3	0.5	0.3	0.3	0.3	0.2
Gadwall	2.1	1.5	0.9	0.9	0.9	1.3	1.0	0.7	1.5
Am. Pidgeon	1.1	1.7	1.1	0.7	1.3	1.2	1.2	1.3	1.6
Pintail	6.2	9.0	10.1	5.5	5.3	5.0	4.5	5.2	3.9
G. W. Teal	8.6	6.4	11.1	6.1	11.9	9.5	9.6	5.0	13.2
B. W. Teal	13.7	10.8	12.9	23.6	10.2	.410	36.7	30.9	14.2
Shoveller	1.9	1.8	1.8	1.3	1.3	0.9	0.8	0.8	1.1
Wood Duck*	3.2	3.3	6.8	3.7	0.1	3.1	1.1	0.3	0.6
Redhead	1.3	1.9	1.1	0.7	1.1	2.2	0.9	0.6	0.1
Ring-necked	0.6	1.0	0.5	0.8	1.3	0.5	0.4	0.4	0.5
Canvas-back	0.9	1.6	1.2	0.8	1.4	1.1	0.5	0.6	0.4
Lesser Scaup	7.5	5.7	7.5	6.8	9.0	6.7	2.3	3.5	2.9
Golden-eye	0.2	0.3	0.1	0.1	0.2	0.1	0.1	0.1	0.1
Bufflehead	0.2	0.1	0.1	0.2	0.1	0.2	0.1	0.2	0.1
Ruddy Duck	0.4	0.5	0.7	0.4	0.8	0.7	0.2	0.1	0.1
Merganser	0.4	0.2	0.3	0.2	0.2	0.2	0.1	0.1	0.1
TOTAL DUCKS	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Canada Geese	16.6	27.2	49.5	29.3	20.4	48.5	26.6	15.0	28.1
Blue Geese	41.7	45.6	19.3	30.5	35.5	19.9	33.4	43.6	31.6
Snow Geese	41.5	27.2	29.4	34.9	42.9	27.0	38.5	33.9	36.8
White Fronted Geese	0.2			0.6	0.9	2.0	0.0	0.5	1.2
Other Geese			1.8	4.7	0.3	2.6	1.5	1.0	2.3
TOTAL GEESE	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Banded Ducks Shot Previous Year		8	6	2	5			13	8
Opening Dates							October 6,	October 5,	
Closing Dates							December 14,	December 13,	

* There was a closed season on wood duck in 1954, 1956, 1957 and in 1958 but the figures indicate known dead wood ducks.

Appendix

Table 1:

1958 RECAPITULATION OF DUCK KILL BY COUNTY

	BREMER	BUCHANAN	BUENA VISTA	BUTLER	CHEROKEE	CLAY	CLAYTON	DALLAS	DAVIS	DECATUR	DES MOINES	DICKINSON
Total Number Hunters Checked	434	63	295	124	13	194	56	22	86	20	268	4
Total Number of Hours Hunted	1958	86	705	365	36	326	87	73	97	29	1584	10
None Taken												
Number of Hunters	191	22	109	71		99	19	9	39	12	63	2
Hours Hunted	587	26	244	207		137	30	16	50	19	333	4
Mallard	202	4	107	19	34	48	15	28	24	11	201	3
Black Duck							1				1	
Gadwall	5		2	2		4		2	1		4	
Baldpate	6		2			3	6		1		9	
Pintail	12		4	2		1	1	5			11	
G. W. Teal	39	1	96	13		15	8	1		2	22	
B. W. Teal	15		33	22		41	14	2	4		36	
Shoveller	1		2	3		3		3	1		4	
Wood Duck	21					1					1	
Redhead						1					1	
Ring-Necked									1		2	
Canvas-Back	2	1				3			1		2	
Lesser Scaup	4	25	12			5			7	11	18	
Golden-eye												
Bufflehead											1	
Ruddy Duck	3	3									1	
Merganser	1											
TOTAL DUCKS	311	34	258	61	34	125	45	41	40	24	314	3
Canada Geese	2		20	6							4	
Blue Geese	14		22			3					13	
Snow Geese	15		20	1		6					2	
White Fronted Geese											2	
Other Geese	4										3	
TOTAL GEESE	35		62	7		9					24	
Coots	5					2					3	

Appendix

1958 RECAPITULATION OF DUCK KILL BY COUNTY

Table 1:
(Continued)

	EMMET	FREMONT	FLOYD	GRUNDY	HAMILTON	HANCOCK	HARRISON	HENRY	HUMBOLDT	IOWA	JACKSON	JASPER
Total Number Hunters Checked	101	277	7	7	103	23	184	1	79	30	239	97
Total Number of Hours Hunted	234	1082	24	15	290	129	821	2	193	165	1100	406
None Taken												
Number of Hunters	35	60		4	44	2	76		19		52	43
Hours Hunted	59	221		10	110	5	223		30		234	139
Mallard	8	200	11	5	16	27	64		30	24	132	21
Black Duck											1	
Gadwall	2	1					8			2		
Baldpate	6	4			1		2				1	1
Pintail	4	15			8	4	48		3	2	23	4
G. W. Teal	10	73			9	19	2		12	12	34	4
B. W. Teal	34	50	1		4	12	23		18	48	84	3
Shoveller	4	5			3		3		1	3	4	1
Wood Duck	1	3									2	
Redhead										1		1
Ring-necked					3			4			4	1
Canvas-back		2									1	
Lesser Scaup		8			4	5						3
Golden-eye												
Bufflehead												
Ruddy Duck					3							
Merganser		2			1				1			
TOTAL DUCKS	69	363	12	5	52	67	150	4	65	92	286	39
Canada Geese							40		9		3	4
Blue Geese	1	26			1		16		11	7	1	1
Snow Geese	3	31		6	4		40		8	6		
White Fronted Geese		2										
Other Geese									2			
TOTAL GEESE	4	59		6	5		96		30	13	4	5
Coots											3	

Appendix

1958 RECAPITULATION OF DUCK KILL BY COUNTY

Table 1:
(Continued)

	JEFFERSON	JOHNSON	LEE	LOUISA	LUCAS	MADISON	MARSHALL	MITCHELL	MONONA	MUSCATINE	O'BRIEN	PALO ALTO
Total Number Hunters Checked	76	37	136	965	16	1	165	13	29	33	3	358
Total Number of Hours Hunted	133	128	399	6235	30	4	544	37	147	126	12	1091
None Taken												
Number of Hunters	47	14	21	242	2		67	1	7	4		70
Hours Hunted	78	46	65	1216	4		230	2	40	13		146
Mallard	6	11	220	1231	28		25	16	16	22	1	134
Black Duck		1		5			1					
Gadwall				15					5		2	11
Baldpate	5			24	1	2				5		7
Pintail		3	3	21	4		10	1		1		11
G. W. Teal		5	35	19	1			6	21	12		248
B. W. Teal	6		16	14			28	1	11			199
Shoveller	4		2	3					1			4
Wood Duck			1	3						1		2
Redhead				1								
Ring-Necked			5	5						2		
Canvas-Back			6	3			1			1		
Lesser Scaup	4		19	11					2	1		10
Golden-Eye												
Bufflehead												
Ruddy Duck				1								2
Merganser							3					
TOTAL DUCKS	25	20	307	1356	34	2	68	24	56	45	3	628
Canada Geese			3	2			14	1				7
Blue Geese	2		3				13		1			12
Snow Geese							18		4			6
White Fronted Geese												
Other Geese									4			3
TOTAL GEESE	2		6	2			45	1	9			28
Coots	4			18			2			1		27

Appendix

1958 RECAPITULATION OF DUCK KILL BY COUNTY

Table 1.
(Continued)

	PLYMOUTH	POCAHONTAS	POLK	RINGGOLD	SAC	SCOTT	SIOUX	TAMA	UNION	VAN BUREN	WASHINGTON	WOODBURY
Total Number Hunters Checked	65	143	182	31	365	209	52	32	40	46	16	477
Total Number of Hours Hunted	110	411	465	75	719	992	169	76	119	95	47	1886
None Taken												
Number of Hunters	21	27	72	11	218	91	18	11	12	32	13	118
Hours Hunted	25	67	182	35	415	433	57	21	27	60	38	382
Mallard	133	47	68	6	88	207	93	13	28	3	2	318
Black Duck			2			2						
Gadwall	1	6			5	1	2					23
Baldpate	1	2	3		4		1		3			3
Pintail	1	14	19	5	2	2	1	1	1			13
G. W. Teal	1	33	7	10	18	8	1		5			36
B. W. Teal	5	87	27	3	10		3		10	2	3	23
Shoveller		3	3		4	1	3		1			5
Wood Duck												2
Redhead			2				1					1
Ring-Necked					4							
Canvas-Back					1			1				
Lesser Scaup			2		14	4			7			20
Golden-Eye					6							
Bufflehead					2							
Ruddy Duck												
Merganser					1							
TOTAL DUCKS	142	192	133	24	159	225	105	15	55	5		444
Canada Geese	2	1	3		7	6						50
Blue Geese	1	2	3	2	9	1		6				33
Snow Geese	1	4	1	2	6			30		2		24
White Fronted Geese												
Other Geese		4										
TOTAL GEESE	4	11	7	4	22	7		36				107
Coots		2			2							22

Appendix

1958 RECAPITULATION OF DUCK KILL BY COUNTY

Table 1.
(Continued)

	WORTH	WRIGHT
Total Number Hunters Checked	90	127
Total Number of Hours Hunted	221	204
None Taken		
Number of Hunters	29	54
Hours Hunted	54	67
Mallard	12	19
Black Duck		1
Gadwall		1
Baldpate	3	
Pintail	1	2
G. W. Teal	24	14
B. W. Teal	16	39
Shoveller	1	
Wood Duck		
Redhead		
Ring-Necked		
Canvas-Back		
Lesser Scaup		
Golden-Eye		
Bufflehead		
Ruddy Duck		
Merganser		
TOTAL DUCKS	57	76
Canada Geese	1	7
Blue Geese		10
Snow Geese		10
White Fronted Geese		
Other Geese		
TOTAL GEESE	1	27
Coots	8	

The 1958 Quail Season

by
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Game Biologist

The 1958 quail season opened on November first in 63 Iowa counties. In 52 counties shooting was permitted through December 15, while in 11 other counties shooting was permitted through November 24. Hunting was legal from 8:30 a.m. to 4:30 p.m. Bag limit was six posession limit 12.

There were three changes from 1958. The bag limit was extended to 12 from six because pre-season checks indicated that birds were plentiful: Woodbury County was opened to quail shooting for the first time in recent years, and in counties on the perimeter of the quail range, shooting was permitted for 24 days instead of the previous 15.

This report includes results of the 1958 season in Iowa, comments on use of dogs, a report from two individual quail hunters, and some pertinent miscellaneous records.

Methods:

Data on which this paper is based were collected by conservation officers and by the biologist in charge. Instructions and cards for collecting the field information were mailed out before the hunting season. Spaces were provided on the cards for entering the following information: county where birds were killed; number of hunters; whether hunters were local or from a distance; hours the party hunted; whether a dog was used; number of coveys flushed; number of quail shot and whether the men thought success was the same, better, or poorer than in 1957. Private records and information from other states was gathered by the biologist.

State-wide Success:

During the 1958 quail season in Iowa, 403 Party Hunting Report Cards were filled out: an average party size of 2.5 men was indicated. Most quail hunters traveled less than 25 miles to shoot, and when asked their opinion of the season compared to 1957, 43 per-cent thought that the season was the same as 1957, 45 per-cent thought it was better, while 12 per-cent believed it was poorer.

Following the 1957 shooting, 243 cards were returned and these revealed that average party size was 2.3, and most traveled less than 25 miles to hunt while 45 per-cent believed the season was the same, 32 per-cent thought it better, and 21 per-cent thought it poorer than 1956.

Table 1: Party Hunting Success, 1955 Through 1958.

Year	Hr. Per Covey	No. Coveys Flushed	Birds shot Per Covey	Hr. Per Quail	No. Quail Per Trip
1955	1.8	1.9	2.6	0.7	5.0
1956	1.5	2.3	2.3	0.6	5.3
1957	1.8	2.0	2.8	0.6	5.6
1958	1.7	2.1	3.1	0.5	6.7

Every indication was that success improved over 1957. Less hours were required per covey, more coveys were flushed per party trip, more quail were killed per covey, less time was required per quail shot and more quail were shot per trip.

Results By Districts:

In the south-central part of Iowa 820 quail were shot during 908 man-hours in the field. In the south-eastern part of the state 728 quail were shot when 905 man-hours were spent afield; in the east-central, 20 quail were shot during 33 hours, and in the southwest, 660 quail were taken in the course of 883 hours of hunting. In border counties, 409 birds were shot in 636 hours of hunting. The following table gives some comparable figures on this aspect of hunting.

Table 2: Hunting Success in Hunter Hours Per Quail by Agricultural Districts, 1955 through 1958.

District	1955	1956	1957	1958
South-central	1.6	1.2	1.4	1.1
East-central	2.9	1.2	3.0	1.6
Southeast	1.4	1.4	1.3	1.2
Border counties*	1.9	2.2	2.2	1.5

* Border Counties Lie To The North and To The West of The Main Quail Range.

Hunting in Individual Counties:

Of 63 counties open in 1958 for quail shooting, report cards were received from 39. In some areas the quail shooting is incidental to rabbit or pheasant shooting. In some others, it was reported that quail hunters were seldom interviewed and consequently only a few cards were filled out. The following counties had the highest hunting success; Adams, Decatur, Lucas, Taylor, VanBuren, Warren, Wayne. In the seven counties, two or three birds were taken per party hour in the field. In contrast, in Polk, Union, Marshall, and Story, one bird was shot for each party hour. In Woodbury, two hours were used for each quail shot.

Highest number of coveys flushed during one trip was reported as 10 or 12 in VanBuren county. Some parties elsewhere reported comparable unusual hunting results. In the table below is illustrated the most successful party reports, and included are comparisons with results of 1951 which was one of the poorest recent hunting seasons, and with 1956 which was comparable to 1958.

Table 3: Success in Locating Coveys, 1951, 1956, and 1957.

County	1951		1956		1958	
	No. Coveys	Party Hours	No. Coveys	Party Hours	No. Coveys	Party Hours
Clarke	3	3			9	7
Davis	5	5			9	7
Decatur	4	2	9	7	9	6
Taylor			4	5		
VanBuren	4	4			10 or 12	7
Wayne	5	6	4	5	7	6

Long and Short Seasons and Hunting Periods:

There were 52 counties in the 1958 long season zone. Reports were received from

33. On the 375 cards received, it was reported that 936 men spent 1346 part hours to flush 809 coveys and shoot 2617 birds. Most thought 1958 hunting was the same or better than 1957. Only a few parties said they did not find quail. Average 1958 hunting success for individual hunters was 1.3 man-hours per bird. In 1957 the success rate was 1.4 man-hours per quail.

Short season records indicated that in 11 counties 58 parties were contacted, there were 61 men, they hunted for 108 party hours to flush 54 coveys and shoot 92 quail. Most thought the 1958 season was better than 1957; only a few did not find quail. In 1958 in the short season zone, the average gunner took one quail for each 1.6 hours he hunted. In 1957 the time was 2.2 hours per bird.

Results per Hunting Period:

In order to have information on results of hunting during the three two-week long periods of the quail shooting season the officers were asked to contact one-third of the subjects in the first two weeks of the hunting period, one third in the second two weeks period, and the final contacts were to be made during the last part of the season which was the first two weeks of December.

Several states report that most quail hunting is done early in the season. In Iowa, a small sample of hunting indicated this was true. Officers found that parties were more plentiful early in November.

In the period, November 1, through 15, 1.2 hours were required per bird bagged. During the second two weeks period the result was the same, while during December 1.6 man-hours of hunting netted one bird.

Use of Dogs, Individual Records and Miscellaneous:

Results of using dogs in quail hunting was indicated by a sample from five counties which were; Clarke, Davis, Decatur, Lucas and Adams. Sixty two cards on hunting with dogs recorded 654 quail shot from 210 coveys, during 260 party hours in the field. The cards indicated 2.7 quail per party-hour and 1.2 hours spent per covey flushed.

For those not using dogs there were 18 cards which showed 104 quail killed, 35 coveys flushed, 64 party hours in the field to kill 1.6 birds per hour, and 1.8 hours were spent per covey flushed.

Records of Hunting by Individuals:

Two men made records of their 1958 quail hunting. One hunter in Corydon reported that with friends he made 22 trips, shot 264 quail from 94 covey rises at a rate of 4.3 coveys per trip. From each covey 2.8 birds were killed. On an average trip 12.9 birds were taken. Three to nine coveys were seen per trip. The hunter thought late afternoon was the best time for locating birds.

Early in the season, this man observed 12 coveys with particular attention to age of birds. He reported that two of these contained squealers or very young, while a third was composed entirely of the half-grown quail.

The second hunter from Chariton, reported that his parties shot 157 quail from 49 covey rises. Seventy-Six of the birds shot were hens, 81 were cocks. A total of 52.5 hours was spent in the field and there were 39 hunters.

Field conditions were better for hunting in 1958 than the previous season. More corn and beans were harvested.

Temperatures averaged higher than in 1957. However, during the 45 day 1958 quail shooting period at Ottumwa, the temperature remained below 32°F. for 16 days. There was a low of 32° or lower at sometime during each of 27 days. It was 0° or below on six days.

In 1958 at Creston near the western end of the Iowa quail range the temperature was 32° or below for 16 days while for 32 days there was a low of 32° or lower. It was below 0° for five days.

In 1957 at Ottumwa, it was below 32°F. all day for 5 days, there was a low of 32° at some time during each of 32 days with no days of zero temperature.

At Creston, temperature was 32° or less all day for three days, 32° or lower at some time during each of 34 days. There was no zero temperature. The greater number of unpleasantly cold days in 1958 did not seem to have an adverse effect on hunting success.

In addition to the high hunting success in Iowa, two other states indicated that shooting was above average. Nebraska had what was described as the best season in 15 years, Louisiana experienced the best quail shooting season in a decade.

Conclusions

Most men who hunted quail in 1958 reported good results and only a few found no birds. Some saw coveys but had no shooting. Cold days and unusually heavy vegetation were a handicap.

Factors that may have contributed to above average success for 1958 were: first, a succession of moderate winters favorable to brood stock; second, a long productive hatching period; third, more suitable evironment due to changes in farming practices or to the favorable rainfall and temperatures of 1958.

Summary

1. The 1958 quail hunting season was open in 63 counties.

2. Data from the 403 party-hunting cards returned to the biology section indicated better hunting than in 1957.

3. Best hunting success was reported in south-central Iowa.

4. Ten or more coveys were flushed on one trip in Van Buren County. In three other counties nine coveys were flushed per trip, for three trips.

5. Unusually good 1958 quail hunting has been reported in two other states.

Observed Sex Ratios as Shown by the Winter Pheasant Count 1959

by
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Game Biologist

The annual winter pheasant count was conducted by conservation officers during January and February to determine the sex ratio of Iowa's post season pheasant population. The results were used to calculate the percentage of cocks harvested in 1958 and are necessary to complete the 1959 spring survey. A hunter questionnaire survey was conducted last winter requesting information about the 1958 season. When these results are completed, a total estimate of the 1958 fall population will be possible by applying the percentage of cocks harvested as determined by the winter count.

Procedure was similar to that used for previous surveys. Conservation officers were instructed to count birds only during the presence of a complete snow cover. Cards were enclosed so that reports could be made during each two week period.

Weather and cover conditions was very favorable for the sex ratio count. Fields were stripped of all cover and adequate snowfall was present during February for an accurate check of pheasant concentrations.

Officers recorded a total of 74,078 pheasants during the census which almost tripled the number reported in 1958. The observed sex ratio was 3.1 hens per cock compared with a ratio of 2.3 in 1958. The figure for 1957 was 3.3 hens per cock.

The past season sex ration obtained during the winter survey indicated that 64 per-cent of the cocks were shot last fall. Although the harvest of roosters improved in 1958 when compared to 1957, it remained about equal to previous results in 1955 and 1956. The 44 per-cent increase in the daily shooting hours, and the increased possession limit, apparently had little effect on the state-wide harvest last fall. There were indications, however, that the harvest of roosters was improved in several prime areas of the state. These will be discussed later.

Favorable checking conditions and the excellent cooperation of conservation officers produced a large sample of birds (Table 1.). Although most of the birds were recorded in the northern pheasant range, fair samples were obtained in other marginal districts.

Table 1. Observed Sex Ratios Of Pheasants Reported By Agricultural Districts 1959.

Districts	Hens	Cocks	Sex Ratio
1. Northwest	15,549	6,143	2.5
2. North central	21,207	7,079	3.0
3. Northeast	10,699	2,171	4.9
4. West central	2,084	706	3.0
5. Central	3,726	1,225	3.0
6. East central	1,412	423	3.3
Southern 3 districts	1,295	359	3.6
Total for State	55,972	18,106	3.1

A comparison of the observed sex ratios revealed that the harvest of ringnecks varied considerably among the nine districts. The hen per cock ratio in northwest Iowa indicated that only 57 per-cent of the roosters were shot which was below normal for the state. The kill percentage in northeast Iowa was the highest in recent years. Hunters bagged 78 per-cent of the available roosters in this area of Iowa's prime pheasant range. Records from the southwest district also show a more favorable harvest of 73 per-cent. About two-thirds of the ringnecks were removed during the season over the rest of the pheasant range which was equal to the state average.

Table 2: Comparison of Observed Sex Ratios by Agricultural Districts - 1956-1959.

Districts	Observed Sex Ratios			
	1956	1957	1958	1959
1. Northwest	2.8	3.4	2.1	2.5
2. North central	3.3	2.5	2.0	3.0
3. Northeast	3.8	4.1	2.4	4.9
4. West central	4.0	3.9	2.0	3.0
5. Central	4.6	4.7	3.1	3.0
6. East central	3.8	3.7	3.1	3.3
7. Southern Iowa	2.7	2.5	2.0	3.6
State Average	3.3	3.3	2.3	3.1